DOCUMENT RESUME

ED 170 874 **EA 011 627**

AUTHOR	Knapp, John L.; And Others
TITLE	A Cost Study for Year-Round Schools in Prince William County.
INSTITUTION	Virginia Univ., Charlottesville. Tayloe Murphy Inst.
PUB DATE	Oct 78
NOTE	157p.; Not available in paper copy due to small print used in tables
AVAILABLE FROM	Tayloe Murphy Institute, P.O. Box 6550, University of Virginia, Charlottesville, Virginia 22906 ($5.00)
EDRS PRICE	MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	Average Daily Enrollment; *Cost Effectiveness; *Data Analysis; Elementary Secondary Education; Expenditure Per Student; Operating Expenses; *Program Evaluation; School Statistics; *Year Round Schools
IDENTIFIERS	45 15 Plan; Virginia (Prince William County)

ABSTRACT

A study of six paired schools in Prince William County, Virginia, involving schools at the elementary, middle, and high school levels operating on traditional and on year-round plans, revealed that given established attendance boundaries the schools were not operating at sufficient capacity to reduce costs through year-round operation. This report compares figures for both kinds of program, adjusted for compatibility, and describes in some detail the methodology used in the study. Extensive tables document the data analyzed. (Author/PGD)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

ED170874

A COST STUDY FOR YEAR-ROUND SCHOOLS IN PRINCE WILLIAM COUNTY

by John L. Knapp,
Scott L. Smith, and John S. Wright

"PERMISSION TO REPRODUCE THIS MATERIAL IN **MICROFICHE ONLY** HAS BEEN GRANTED BY

J. Knapp

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

EA 011 627

Tayloe Murphy Institute
The Colgate Darden Graduate School of Business Administration
University of Virginia

Graphics: Barry A. Jackson
Typing and document coordination: Amanda H. Shull
Typing: Mary L. Bersch
Diane M. Weber

CONTENTS

Page

List of Tables and Figures.................................... v

Summary... ix

Chapter

1. Introduction and Background............................ 1
2. Cost Analysis.. 15
3. Start-up Costs... 70
4. Comparison with Other Studies.......................... 75
5. Study Implications..................................... 86

Appendix Tables... 99

Glossary..113

LIST OF TABLES AND FIGURES

Tables Page

1.1 Average Daily Membership, 1971-72 to 1977-78 6

1.2 Fact Sheet for Sample Schools, 1977-78 8

2.1 Standardized Employee Costs for Sudley Elementary (Traditional) School, 1977-78 18

2.2 Standardized Employee Costs, Actual and Simulated, for Sudley Elementary (Traditional) School, 1977-78 20

2.3 Substitute Days at Year-round and Traditional Schools, 1975-76 to 1977-78 26

2.4 Substitute Teacher Costs, 1977-78 28

2.5 Building and Equipment Costs, 1977-78 31

2.6 Current Dollar Value of Original Cost as a Percent of Insured Value, 1977-78 32

2.7 Actual Utility Costs, 1977-78 35

2.8 Fuel Consumption Analysis for Heating and Cooling, 1975-76 to 1977-78 37

2.9 Standardized Energy Costs, 1977-78 39

2.10 Other Operations Costs, 1977-78 41

2.11 Telephone Costs, 1977-78 43

2.12 Total Operations Costs, 1977-78 44

2.13 Maintenance Costs, 1977-78 46

2.14 Overhead Costs, System and Division-wide, 1977-78 48

2.15 Cost Summary, 1977-78, Part I 51

2.16 Cost Summary, 1977-78, Part II 52

2.17 Cost Summary, 1977-78, Part III 54

Tables Page

2.18 Comparison of costs per ADM under Capacity Utilization for Traditional and Year-round Operation, 1977-78................ 55

2.19 Cost Summary, 1977-78, Part IV................................ 58

2.20 Year-round School Simulations at the Actual ADMs for Traditional Schools, 1977-78................................ 59

2.21 Simulations at Capacity ADM x 1.25............................ 60

3.1 Start-up Costs, Historical and 1977-78......................... 71

4.1 Major Features of Selected Year-round School Cost Studies...... 77

4.2 Savings Per Pupil of Year-round versus Traditional Operation According to Selected Studies................................ 80

4.3 Comparison of Savings or Extra Costs Per Pupil of Year-round versus Traditional Operation According to TMI and Turnkey Prince William Studies................................ 84

5.1 Elementary School Capacity Utilization, 1977-78................ 88

5.2 Middle and Senior High School Capacity Utilization, 1977-78.... 89

A.1 Average Daily Membership in Each Color Group at Year-round Schools, 1977-78.. 101

A.2 Percentage Distribution of Average Daily Membership in Each Color Group at Year-round Schools, 1977-78............. 102

A.3 Standardized Employee Costs for Minnieville Elementary (YRS) School, 1977-78... 103

A.4 Standardized Employee Costs for Marsteller Middle (Traditional) School, 1977-78................................ 104

A.5 Standardized Employee Costs for Graham Park Middle (YRS) School, 1977-78... 105

A.6 Standardized Employee Costs for Stonewall Jackson Senior High (Traditional) School, 1977-78................................ 106

A.7 Standardized Employee Costs for Woodbridge Senior High (YRS) School, 1977-78... 107

A.8 Standardized Employee Costs, Actual and Simulated, for Minnieville Elementary (YRS) School......................... 108

A.9 Standardized Employee Costs, Actual and Simulated, for Marsteller Middle (Traditional) School...................... 109

Tables Page

A.10 Standardized Employee Costs, Actual and Simulated, for Graham Park Middle (YRS) School....110

A.11 Standardized Employee Costs, Actual and Simulated, for Stonewall Jackson Senior High (Traditional) School....111

A.12 Standardized Employee Costs, Actual and Simulated, for Woodbridge Senior High (YRS) School....112

Figures

S.1 Typical Cost Curves.... x

1.1 Average Daily Membership, 1971-72 to 1977-78.... 5

1.2 Color Group Balance at Year-round Schools, 1977-78.... 13

2.1 Percentage Distribution of School Costs by Major Category, 1977-78.... 16

2.2 Elementary School Cost Curves, 1977-78.... 63

2.3 Middle School Cost Curves, 1977-78.... 64

2.4 Senior High School Cost Curves, 1977-78.... 65

4.1 Savings of Year-round Schools in Relation to Capacity Utilization.... 82

5.1 Typical Cost Curves.... 87

7

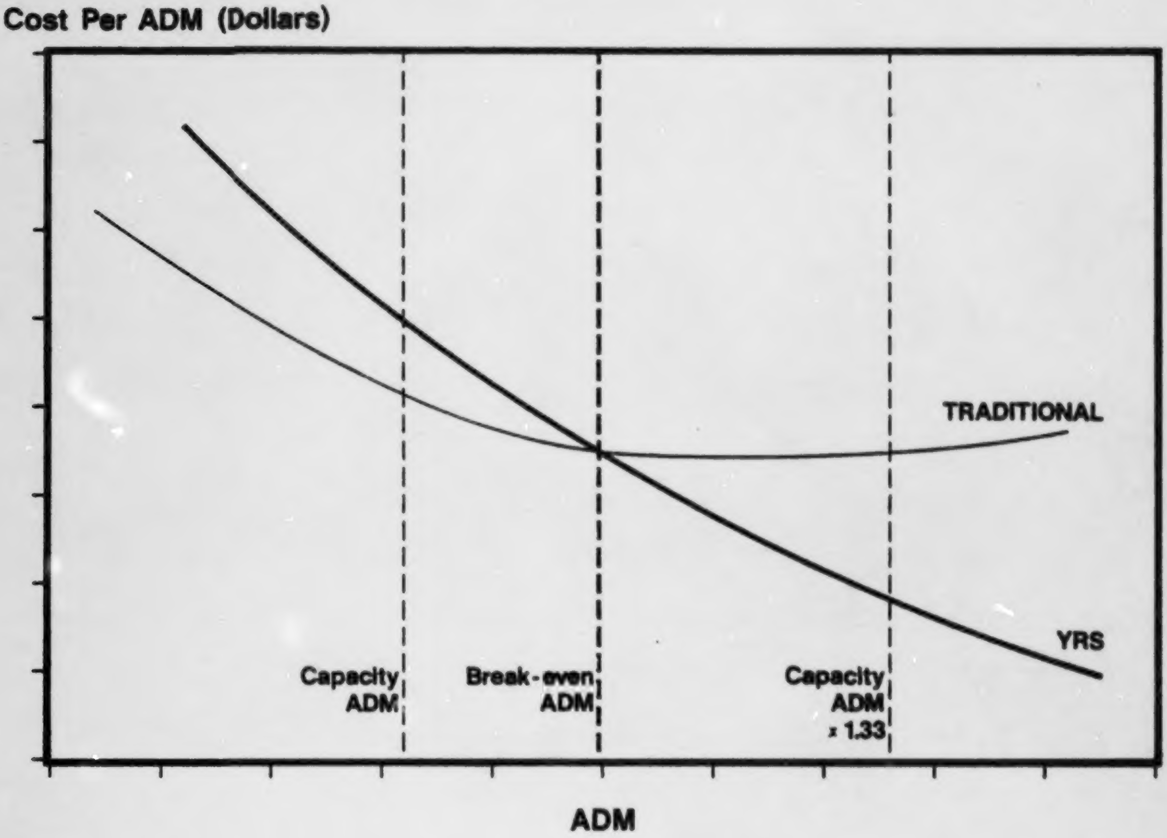
SUMMARY

The purpose of this study was to examine the cost per pupil under both a traditional and a year-round school (YRS) calendar of operation. The determination of which calendar of operation is least costly is not clear-cut. Instead, it depends on whether or not there is sufficient average daily membership (ADM) to make efficient use of the school buildings.

The term capacity ADM is used to reflect the ADM each school building is designed to hold under a traditional calendar. Under the 45-15 system of YRS employed by Prince William County, the capacity ADM of a building expands by one-third (capacity ADM x 1.33) under YRS operation, reflecting the theoretical increase in ADM achievable since only three out of four students assigned to the school will occupy the building on any given day.

The expanded capacity of a YRS school enables the capital costs (building, furniture, and equipment) of that school to be spread out over a larger ADM, reducing costs per ADM. This is the primary attraction of YRS from a cost standpoint. However, cost savings under YRS will not occur unless there is a sufficient ADM to utilize much of the expanded capacity. In fact, ADM may be so low as to make traditional operation the least costly of the two. Figure S.1 shows this situation as it might exist for a particular school or school level (elementary, middle, and senior high).

Figure S.1. Typical Cost Curves



On the vertical axis we measure cost per ADM. On the horizontal axis we measure ADM, increasing to the right. If we assume these curves apply to a particular school, the following inferences can be made in regard to that school. If the actual ADM assigned to the school is equal to its traditional capacity ADM (shown as capacity ADM on the graph), then the cost curves indicate that operating the school under a traditional calendar would be less costly per ADM than operating under a YRS calendar. As the actual ADM assigned to the school is increased, the savings of traditional operation as opposed to YRS operation will decrease. Eventually, the increasing ADM will reach a break-even level where the choice of calendar will make no difference in terms of costs. Of course, an actual ADM assignment which is greater than break-even ADM would result in the YRS operation showing savings over a traditional operation.

In order to expand the analysis from the basis of a single school to a school level or to the whole system, we must redefine the capacity figures to represent the combined capacities of all the schools. Similarly, the ADM scale must also be expanded to include the combined ADMs of all the schools. Once this is done, locating the ADM with respect to capacity would indicate which calendar operation would be least costly to the system as a whole. There are two problems with this analysis, however, both of which may have an impact on the results.

The first problem is that this analysis implies that the school system has perfect flexibility in adjusting attendance zones so that actual ADM assignments as a percent of a school's capacity are made equal over all schools in the system. In reality, this perfect flexibility in attendance zones could not even be approached without additional costs of transportation and inconvenience to some students. These added costs would then have to be weighed against the benefits of the increased flexibility. The analysis of attendance zone flexibility was outside the scope of our study.

The second problem involves the time frame of the analysis. If properly done, the analysis would look not only at existing ADM, but at the future trend in ADM at the various levels. The ADM for a particular point in time could imply a situation that would not exist a year or so later. Again, the analysis of ADM trends was outside the scope of the study, though Prince William County School projections do not foresee any major changes in ADM occurring within the next five years.

With the above-mentioned considerations in mind, the 1977-78 capacity utilizations of the three school levels imply an ADM for each close to their respective capacity ADMs. This indicates that the greater the flexibility in attendance zones, the more likely it is that an all traditional calendar operation would be less costly than an all YRS calendar operation. In addition, should attendance zones be relatively inflexible, then the next least costly alternative may be maintaining the mixed calendar system now in use. In any case, there are numerous alternatives to adjusting capacities which increase the range of cost efficient solutions.

The cost curves in Figure S.1 were developed from an analysis of factor costs for six sample schools composed of a traditional and YRS school at each level. In many cases, the costs had to be standardized so as to make them comparable. Also, simulations of each sample school were run under various ADMs and calendars to provide additional observations. The entire factor cost analysis is reported in Chapter 2.

One of the simulations treated each school as though it had an actual ADM equal to the school's capacity, where the capacity depended on the calendar of operation. This represented an ideal comparison of the two calendar operations because the simulations assume the school system's capacity is very flexible. The results of this ideal analysis show YRS provides a savings at each level. The savings per ADM amounted to about 5 percent for the elementary schools, 4 percent for the middle schools, and 7 percent for the high schools. We can contrast these savings under the ideal comparison with the case of the least ideal comparison. The least ideal comparison is between the two sample schools at each level under their actual ADMs in 1977-78. This comparison showed YRS to have higher costs per ADM of 0.1 percent and 2.6 percent, at the elementary and middle schools, respectively, and yet YRS had lower costs by 11.2 percent at the senior high school level. These cost comparisons parallel the capacity utilizations at the sample schools, where YRS savings were positively related to utilization of capacity.

Since capacity utilization is such a key element, it is interesting to note how many of the YRS schools were actually above the break-even ADM for the individual schools. Of the eighteen YRS elementary schools in 1977-78 only seven exceeded their break-even ADMs. Of the five YRS middle schools, only one exceeded its break-even ADM. In contrast, both YRS senior high schools operated well above their break-even ADMs. If all school levels are combined, we find that slightly less than one-half of actual ADM in YRS schools is in schools operating below their break-even ADMs. In other words, it would be cheaper for these schools to operate on a traditional calendar.

Given the number of YRS schools which did not approach their YRS capacities (equal to traditional capacity ADM x 1.33) an investigation was conducted to determine if the color group breakdowns over the three levels make it difficult to achieve the theoretical increase in capacity of 33 percent. We found no evidence to indicate that the theoretical increase could not be achieved. Therefore, the inability of schools to increase ADM to YRS capacity resulted primarily from insufficient ADMs in the attendance zones.

Our results were generally in line with those of other studies, especially after account is taken for the differences in methodology. A comparison of this study with several others is made in Chapter 4.

Another area of concern was start-up costs, or those costs specific to changing a school's calendar of operation to YRS. For the most part, we found these costs insignificant. A discussion of start-up costs is provided in Chapter 3

Prince William County Schools face a critical juncture--should they continue the present mixed system of traditional and YRS schools (option 1), go completely YRS, by converting the traditional schools in the western part of the county (option 2), or revert to all traditional schools (option 3)?

Option 1, the status quo, does not provide savings in many of the YRS schools because they are operating below their break-even ADMs. At the senior high school level, where the two YRS schools are operating well above their respective break-even ADMs, the situation will be changed dramatically when Potomac Senior High School is opened in 1980.

Option 2, the conversion of all schools to YRS, would involve schools in western Prince William County that for the most part, are already operating below traditional capacity. Thus, there is no need to convert these schools for the sake of adding capacity. Furthermore, most of the school buildings would require the installation of air-conditioning equipment

Option 3, the conversion of all schools to traditional operation, would not impose severe strains on traditional capacity at the middle schools. For the elementary level, a current shortage of traditional capacity could be greatly alleviated by the reopening of Saunders and Washington-Reid. At the senior high school level, the opening of Potomac Senior High School in 1980 will provide the needed traditional capacity. In addition, there are many other ways that traditional capacity could be added, ranging from construction of more classrooms to redefining capacity. Another consideration is that a switch to traditional operation could be phased-in over several years.

The cost figures in the study are limited to costs incurred by Prince William County Schools. There is no analysis of the quality of educational services under YRS and traditional modes of operation, nor is there any consideration of the costs and benefits of the YRS schedule for pupils, parents, teachers, and administrators. Some of these issues are now being addressed in other work being performed for the school system. These other aspects of YRS should definitely be considered when evaluating the results of this cost study.

CHAPTER 1

INTRODUCTION AND BACKGROUND

Purpose of the Study

This study is an analysis of the comparative cost of operating schools in Prince William County under a traditional calendar and under a year-round school (YRS) calendar. The research was performed under a contract between the Prince William County School Board and the Tayloe Murphy Institute. The contract designated the six schools to be compared for school year 1977-78 and stipulated the types of information to be developed. Specifically, the contract called for detailed cost data for the traditional schools of Sudley Elementary, Marsteller Middle, and Stonewall Jackson Senior High and the YRS schools of Minnieville Elementary, Graham Park Middle, and Woodbridge Senior High. The School Board requested actual costs as well as estimated costs under the alternative calendar method of operation.

Explanation of Year-Round Scheduling

Under a broad definition of the term, "a year-round school system" describes any system that operates twelve months rather than nine or ten months. As used in Prince William County, YRS defines a system that is operated under a 45-15 schedule. With such a schedule, pupils assigned to a school are separated into four groups. In Prince William these groups are assigned different colors for easy identification. On any given school day only three of the color groups attend the school while the other color group is on vacation. The school calendar is arranged so that each group attends school for 45 days and then is on vacation for

15 days. Since one group is always on vacation, the school can accommodate a larger number of students than is possible under a traditional scheduling system. Theoretically, enrollment can be expanded by 33 percent.[1/]

Implementation of 45-15 YRS is not unique to Prince William County. The Valley View School District in Romeoville, Illinois was the first school division to use the technique when it adopted 45-15 district-wide in 1970-71. Virginia Beach City, Virginia and Loudoun County, Virginia used 45-15 in some of their schools during 1973-74 and 1974-75, after which they reverted to a traditional schedule. California has a number of year-round schools, most of which are operated on a 45-15 schedule. In 1976-77 California had 56 school districts operating a combined total of 200 YRS schools.[2/]

The Turnkey Study

This is the second cost study of YRS in Prince William County. The first study was performed by Educational Turnkey Systems, Inc. under the direction of Blair H. Curry and John M. Sweeney. That study developed 1971-72 data for Bel Air, Dale City, and Neabsco elementary schools and Godwin Middle School, all of which were YRS schools. The study concluded that YRS operation resulted in savings per pupil of 5.3 percent in the elementary schools and 9.6 percent in the middle school. These cost savings were estimated by using a simulation model that compared costs in the YRS schools with costs in those same schools had they been expanded to

---

1/ 33 percent is used throughout the text. However, actual calculations were based on 33.33 percent since this is a more precise measure of the possible expansion in enrollment.

2/ Joint Legislative Audit Committee, Office of the Auditor General, Fiscal Impact of California's Year-Round School Programs, Report 300 (California: Office of the Auditor General, 1977), p. 5.

accommodate an equal enrollment under a traditional calendar. In developing the simulation, Curry and Sweeney assumed that a YRS school could handle an enrollment one-third greater than a comparable traditional facility.[1/] Thus, the simulation had to allow for a larger building to serve the same number of students.

Turnkey studied the YRS program in its initial year. The detailed work applied to the one middle school; based on that analysis and some additional work, approximations were developed for the three elementary schools. Since there were no YRS high schools in 1971-72, the analysis was limited to the elementary and middle school levels.

This new cost study examines a program which is now older and more established than the program which Turnkey covered. Also, the new study is larger in scope since it covers three YRS schools in detail rather than one, contains comparative data on three traditional schools, and includes high schools as well as middle and elementary schools.

Prince William County Background

Prince William is a large county (338 square miles) in Northern Virginia. The county is included in the Washington, D.C.-Md.-Va. Standard Metropolitan Statistical Area. Although officially "metropolitan," Prince William County is not densely populated. In 1977 the population density was only 392 persons per square mile. By comparison, adjoining Fairfax County had a population density of 1,348.

The current (1977) population of Prince William is 132,400,[2/] up

---

[1/] Blair H. Curry and John M. Sweeney, 45-15 and the Cost of Education (Washington, D.C.: Education Turnkey Systems, Inc., n.d.) p. 5.

[2/] Julia H. Martin and William J. Serow, "Estimates of the Population of Virginia Counties and Cities: July 1, 1976 and July 1, 1977" (Charlottesville: Tayloe Murphy Institute, 1978), p. 3.

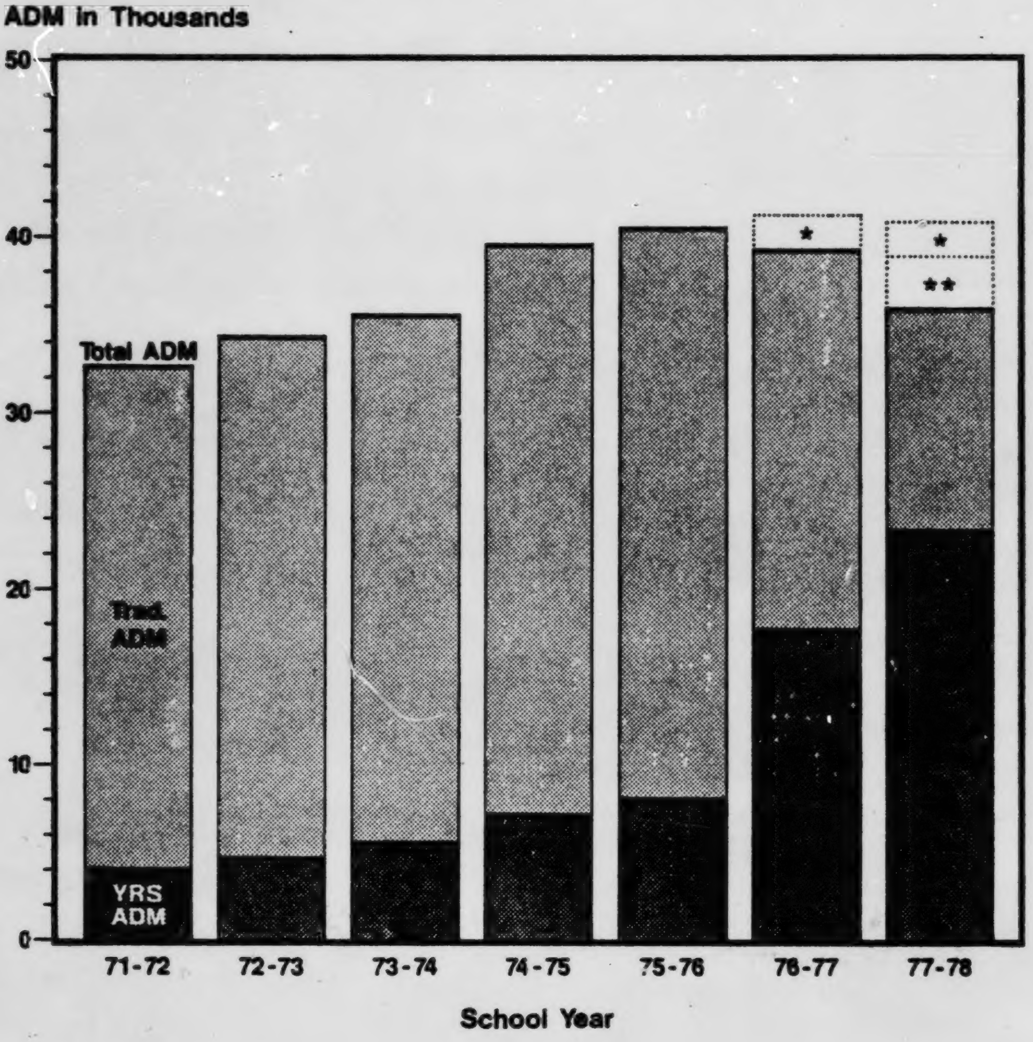
38,900 or 41.6 percent since 1970. In 1975 two towns in the county, Manassas and Manassas Park, became independent cities. The preceding population growth figures were adjusted to exclude these new cities. The very rapid growth of the county from 1970 to 1977 was fueled by a large number of new residents. Net migration, the excess of in-migrants over out-migrants, totaled 24,400 and accounted for more than three-fifths of the population growth. The remaining growth was due to natural increase--the excess of births over deaths.

YRS in Prince William

In 1977-78 there were 35,947 students in the county, making it one of the largest school divisions in Virginia. The school population was distributed across forty-eight schools--thirty elementary schools of which eighteen were YRS, nine middle schools of which five were YRS, five senior high schools of which two were YRS, and four special education schools all of which were on traditional schedules. Year-round enrollment was 23,371 and accounted for 65 percent of total enrollment (see Figure 1.1 and Table 1.1).

Year-round schools were begun in Prince William County in the 1971-72 school year in response to new capacity requirements of a rapidly growing school population. Three elementary schools and one middle school went year-round in that year in the Dale City area. They soon were to be joined by two more elementary schools and one high school in Dale City and by one elementary and one middle school in the Lake Ridge section. In 1976-77 ten elementary, three middle, and two high schools were on YRS schedules, involving approximately three-fourths of the students in the eastern portion of the county. Finally, during school year 1977-78, the schools in the entire eastern portion of Prince William County were put on YRS.

Figure 1.1. Average Daily Membership, 1971-72 to 1977-78



* ADM in Manassas Park
** ADM in Manassas

From the onset of the year-round program to 1977-78 the percentage of county enrollment in YRS rose from 12.5 percent to 65.0 percent. Although the percentage rose in each year, the largest increases were in 1976-77 and 1977-78. During the six-year period from 1971-72 to 1977-78 total ADM in the county increased from 32,589 to 35,947. The latter figure excludes 4,837 ADM in Manassas and Manassas Park cities that would have been part of the Prince William total had the two localities remained towns.

TABLE 1.1

AVERAGE DAILY MEMBERSHIP, 1971-72 TO 1977-78

School Year	ADM YRS	ADM Total	% of Total in YRS
1971-72	4,059	32,589	12.5
1972-73	4,739	34,309	13.8
1973-74	5,604	35,564	15.8
1974-75	7,177	39,568	18.1
1975-76	8,078	40,500	20.0
1976-77	17,753	39,270[a/]	45.2
1977-78	23,371	35,947[b/]	65.0

Source: Prince William School Board, unpublished "green sheet"; Department of Education, Annual Report, 1971-1972 through 1976-1977 editions. Department of Education unpublished data for 1977-78.

a/ Excludes Manassas Park ADM of 2,038.
b/ Excludes Manassas Park ADM of 1,950 and Manassas ADM of 2,887.

In 1976-77 enrollment dropped slightly but this was due to the loss of students to Manassas Park. In 1977-78 enrollment declined again. The reduction was less pronounced after adjustment for the loss of students to Manassas, but even so there was a decrease of 436 students. Thus, after many years of growth the county experienced a decline in 1977-78. Preliminary data for 1978-79 based on early fall enrollment indicate a further decline in the present school year.

Most of the growth in enrollment from 1971-72 to 1977-78 was in the secondary grades, eight through twelve. Of the total increase in ADM of 3,358 the secondary grades accounted for 1,985 or 59 percent, even though at the beginning of the period they represented only slightly over one-third of the ADM. Thus, it is quite clear that the declining birth rate and the characteristics of in-migrants to Prince William County combined to cause enrollment to grow much faster in the upper than the lower grades.

Description of Sample Schools

Basic facts concerning the sample schools are shown in Table 1.2.

Sudley and Minnieville elementary schools are twins; both were constructed in 1972, and they contain the same amount of floor space. The buildings have the same types of heating systems (gas/oil), but in 1977-78 their respective consumption of gas and oil varied significantly. Each school has an oil cooling system, and they are both served by the Prince William Electric Co-op. Water service is provided by different utilities. ADM in 1977-78 was 6.4 percent higher at the year-round school. However, capacity utilization was lower at the year-round school. [Note: throughout this study the term "capacity" refers to the capacity ADM of a building operated under a traditional calendar. The capacity ADM used for each school was the figure most recently determined by the Prince William County school administration and approved by the School Board. Capacity under YRS is shown as "Capacity ADM x 1.33."] While Sudley (traditional) was operated at 100 percent of capacity, Minnieville (YRS) was operated

TABLE 1.2

FACT SHEET FOR SAMPLE SCHOOLS, 1977-78

	Elementary		Middle		Senior	
	Sudley (Traditional)	Minnieville (YRS)	Marsteller (Traditional)	Graham Park (YRS)	Stonewall Jackson (Traditional)	Woodbridge (YRS)
Construction completion date	3/72	7/72	8/63	9/63	5/73	4/74
Additions completion date			7/66;3/71	3/65;4/71		
Capacity ADM	715	710	945	890	2,290	2,380
Gross square footage (with additions)						
Total	53,028	53,028	100,536	99,708	326,000	350,476
Per capacity ADM	74.17	74.69	106.39	112.03	142.36	147.26
Land acquisition cost	0	0	$55,000	$45,000	$350,000	0
Pupil teacher ratio	27.52	27.80	19.11	18.40	20.75	20.83
Heating system	gas/oil	gas/oil	oil	oil	oil	electric
Cooling system	oil	oil	none	electric	oil	electric
ADM, 1977-78	715.53	761.02	837.34	856.43	2,076.81	3,351.85
Capacity utilization:						
ADM as a % of capacity	100.07	107.19	88.61	96.23	90.69	140.83
ADM as a % of capacity ADMx1.33	...	80.39	...	72.17	...	105.63
Electric vendor	P.W. Co-op	P.W. Co-op	P.W. Co-op	VEPCO	P.W. Co-op	VEPCO
Water vendor	Greater Manassas	Dale Service	Manassas City	Occoquan--Woodbridge	Greater Manassas	Occoquan--Woodbridge
Percentage of student bused	none	49.1	100.0	74.3	89.1	92.4

at only 80 percent of capacity ADM x 1.33. Pupil teacher ratios at the two schools were virtually the same.[1/] All the children attending Sudley walked or provided their own transportation. At Minnieville nearly one-half of the students were bused.

Marsteller and Graham Park middle schools were constructed in 1963 using the same design. Two additions were made to each school with the most recent occurring in 1971. Both schools have about the same square footage and the same type of heating system (oil). When Graham Park was converted to YRS, electric air conditioning was installed. Marsteller has not been air-conditioned. The two schools are supplied by different electric and water utilities. In 1977-78 ADM was 2.3 percent higher at the year-round school. While Marsteller (traditional) was operated at 89 percent of capacity, Graham Park (YRS) ran at only 72 percent of capacity x 1.33. The pupil teacher ratio was slightly higher at the traditional school.[2/] All of Marsteller's students were bused compared with 74 percent for Graham Park.

Stonewall Jackson and Woodbridge senior high schools were constructed in 1973 and 1974, respectively. Woodbridge is slightly larger with about 8 percent more floor space. The schools have fundamental differences in the method of heating and cooling; Stonewall Jackson used oil for heating and

---

[1/] The pupil teacher ratio for the elementary schools was calculated by multiplying ADM by 194 and dividing by total number of teacher contract days, a computation method similar to the one used by Prince William County Schools. Title I, art, music, and physical education teachers were excluded because individual teachers may serve more than one school.

[2/] The pupil teacher ratio for middle and senior high schools was calculated by multiplying ADM by 194 and dividing by total number of teacher contract days. Title I and special education teachers were excluded because the teachers are assigned on the basis of school population characteristics.

cooling whereas Woodbridge is all-electric. Different water utilities serve the two schools. In 1977-78, ADM was 61 percent higher at Woodbridge YRS. Stonewall Jackson was operated at 91 percent of capacity compared with 106 percent of capacity x 1.33 at Woodbridge. Thus, even though Woodbridge's capacity was increased by one-third under YRS, the school was still operated at an ADM exceeding capacity. Pupil teacher ratios at the schools were virtually the same. Buses were the predominant method of transportation for pupils at both schools. At Stonewall Jackson 89 percent of the students were bused, and at Woodbridge the comparable figure was 92 percent.

The Color Balance Problem

A major concern in the implementation of YRS is that it may be difficult to keep the four color groups in balance. The 33 percent increase in capacity that is theoretically attainable assumes that each color group will account for 25 percent of enrollment. This is easily demonstrated by an example. Assume a school with a traditional capacity of 300 ADM. Under YRS it could accommodate four color groups of 100 each because on any given school day there would be three groups in session and one on vacation. Since there would be 100 ADM in each color group, each would represent 25 percent of the total. Any three groups would add to 75 percent of the total and the increment provided by the fourth group would equal one-third:

$$\frac{25\%}{25\% + 25\% + 25\%} = \frac{25\%}{75\%} = \frac{1}{3} = 33\%$$

If the color groups were out of balance, and the sum of the largest three color groups equaled the capacity of the building, then a one-third increase in ADM could not be achieved.[1/] For example, assume capacity is not exceeded and that the distribution of enrollment is as shown.

	% of Total
Red	26
Blue	26
Green	17
Orange	31
	100

The largest percentage that could be accommondated on a given day would be the sum of the red, blue, and orange groups. The increment from the green group would be only 20 percent.

$$\frac{17\%}{26\% + 26\% + 31\%} = \frac{17\%}{83\%} = \frac{1}{5} = 20\%$$

In the operation of YRS schools in Prince William County the school administrative staff has often used 25 percent as the increase in capacity to be expected from YRS. Although some members of the staff agree with the theoretical gain of 33 percent to be made from YRS, they do not think it is regularly attainable. The reason for using the 25 percent figure is two-fold. First, this was close to the average percentage increase of ADM over cpacity experienced in Prince William County in the early years of YRS. Second, the maintenance of color balance could be quite difficult when population grows at different rates in small color attendance zones, and it is possible that even though color balance could be achieved at one school level, the feeder schools might be out of balance.

The first reason for assuming a 25 percent increase is not a convincing argument, since taken alone, it only indicates that the school population was not large enough to achieve a 33 percent increase. The

---

1/ An increase of one-third or more could be achieved if the school administration were willing to exceed building capacity in one or more of the 45-day blocks. In 1977-78 this was the case for seven YRS schools (Rockledge, Kerrydale, Washington-Reid, Triangle, and Bel Air elementary schools and Woodbridge and Gar-Field senior high schools) which had actual ADMs greater than capacity ADM x 1.33. See Tables 5.1 and 5.2.

second reason appears plausible. To test its validity we developed information on enrollment by color group for all YRS schools in 1977-78. This information is shown in Figure 1.2 and in Appendix Tables A.1 and A.2. As shown in the chart, the color balance was very close to 25 percent in each color group. The majority of the schools (16 out of 25) had all four color groups within ±5 percentage points of 25 percent, (the white band) in the chart). Thus, for roughly two-thirds of the schools the color balance allows for an expansion equal to or greater than 25 percent. There were a few major exceptions at the elementary level (Elizabeth Vaughan, Washington-Reid,[1] and Dale City), but on the whole, the schools did a good job of keeping close to the theoretical ideal. This is illustrated by the weighted averages for Woodbridge Senior High School and its feeder schools and for Gar-Field Senior High School and its feeder schools.

	Woodbridge, % of Total	Gar-Field, % of Total
Red	25.0	24.2
Blue	25.0	25.7
Green	24.5	23.5
Orange	25.5	26.6
	100.0	100.0
Top 3	75.5	76.4

For Woodbridge the smallest group (green) added 32.5 percent $\frac{24.5\%}{75.5\%}$ and for Gar-Field the smallest group (also green) added 30.8 percent $\frac{23.5\%}{76.4\%}$. On the basis of this analysis, it is clear that the attainment of color balance is not a serious problem and that the concept of a 33 percent increase in capacity due to YRS is a reasonable standard.

Sources of Information

The study is based on actual expenditure data for the six sample schools. Sources of data were: (1) internal financial reports regularly

---

[1] Washington-Reid was closed for 1978-79.

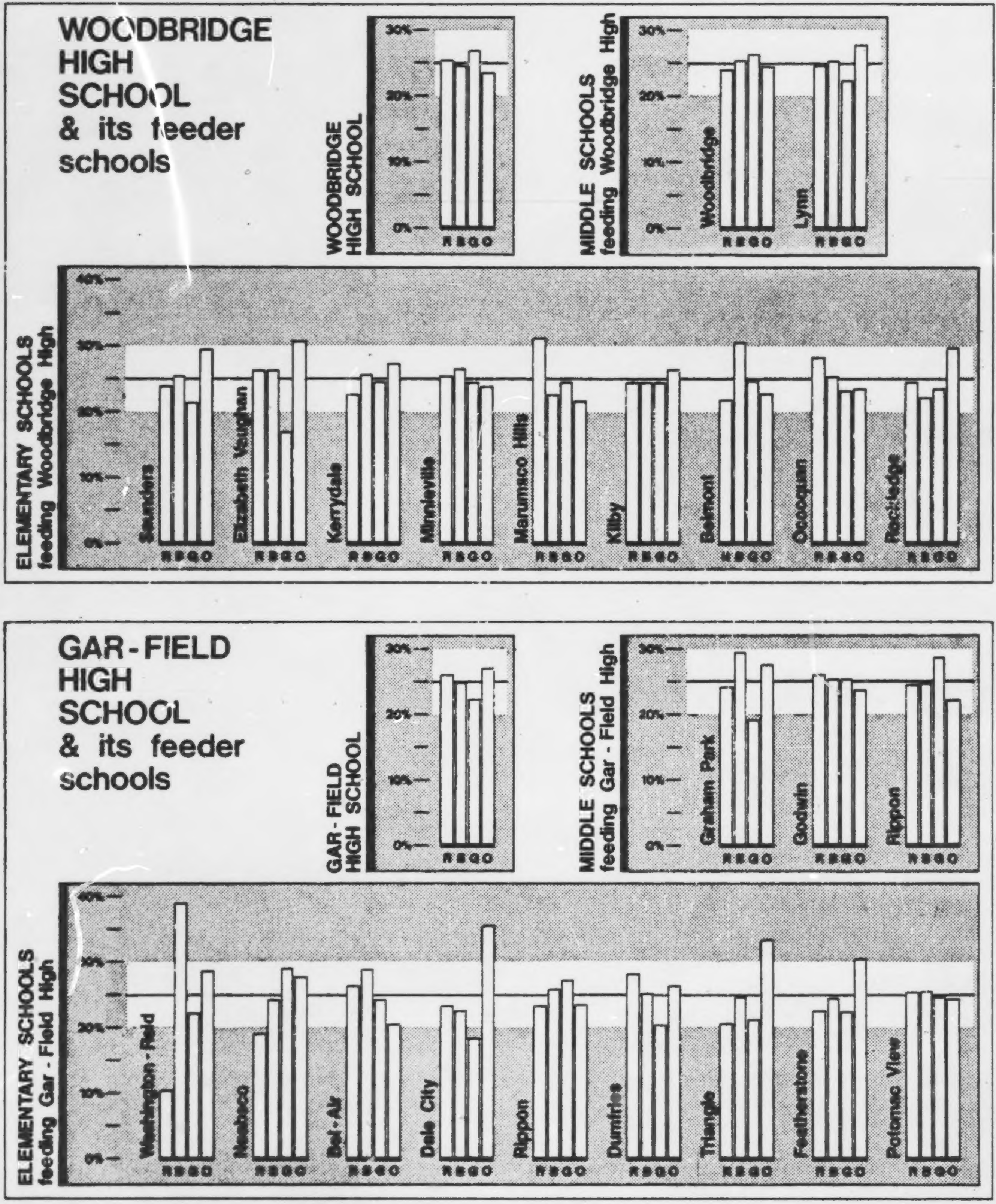


Figure 1.2. Color Group Balance at Year-Round Schools, 1977-78

produced by the school administration; (2) answers from direct inquiries to staff members; (3) other published and unpublished sources. In all cases where the source of data was other than the school administration, that source is noted. To collect the data we made four field trips and conducted two status-of-report briefings for the school administration staff. The field trips, which involved interviews with nineteen senior staff members of Prince William County Public Schools, were supplemented by extensive correspondence and numerous telephone conversations.

CHAPTER 2

COST ANALYSIS

Introduction

In this chapter we provide a detailed description of how the cost data were assembled and handled for eighteen cost categories aggregated into eight major groups. The cost categories are then summed to give total costs, and a comparison is made of costs under varying assumptions.

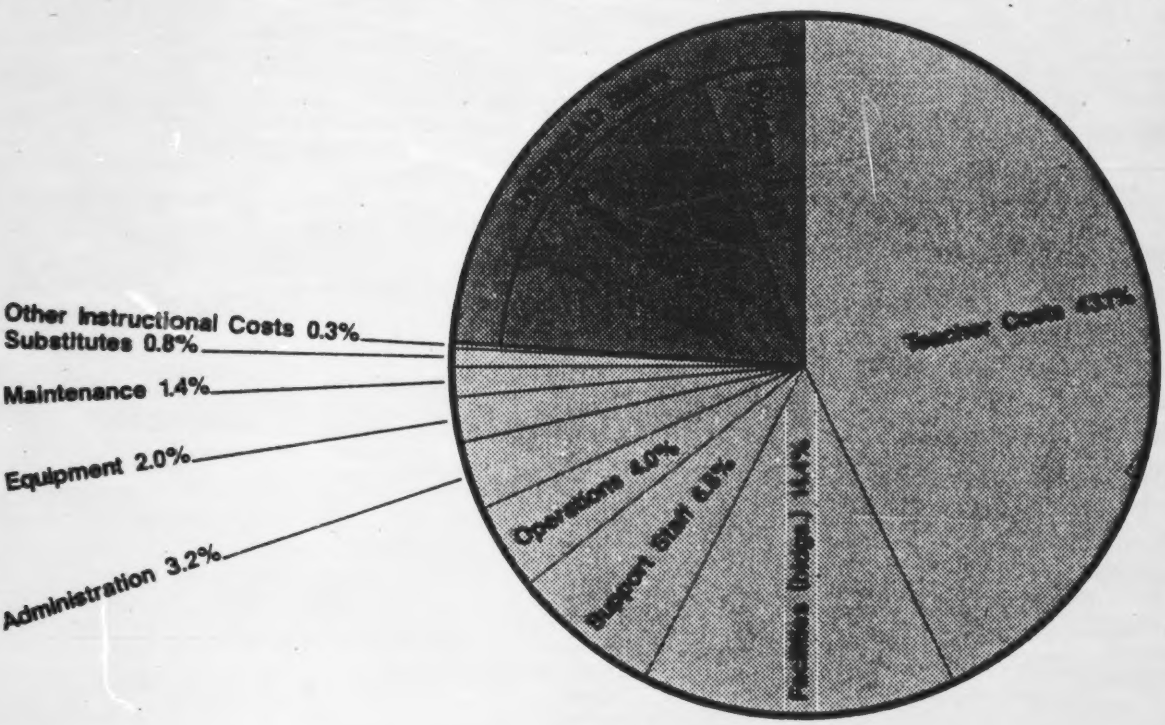
The cost figures are limited to costs incurred by Prince William County Schools. There is no analysis of the quality of educational services under YRS and traditional modes of operation, nor is there any consideration of the costs and benefits of the YRS schedule for pupils, parents, teachers, and administrators. Some of these issues are now being addressed in other work being performed for the school system. These other aspects of YRS should be considered when evaluating the results of this cost study.

To gain perspective on the relative importance of the detailed cost categories see Figure 2.1. This diagram shows the distribution of 1977-78 per pupil costs in Prince William County schools based on the results of our six school sample.[1/] Teacher costs are the single most

---

[1/] Costs for each school were weighted by the percentage of total ADM in each level and type of school. For example, the cost figures for Sudley elementary were weighted by a factor of 0.1513, the proportion of total ADM in traditional elementary schools. The weighted cost for all schools was $1,681.69 per ADM. This figure differs from total disbursements per ADM of $1,795.27 which the system reported to the Virginia Department of Education in the "Annual School Report," Form S-2. The principal difference is that our series includes annualized capital costs whereas the reported figure includes debt service and capital outlay. Also a slight difference results from the fact that the reported figure is based on a higher total ADM (35,952) than the ADM figure used to derive our estimate (35,198.61).

Figure 2.1. Percentage Distribution of School Costs by Major Category, 1977-78



important category, accounting for 43.1 percent of total costs. Facilities (buildings) rank second among the costs which are specific to each school; they represent 14.4 percent of total costs. Overhead, which is not school-specific, is discussed later. Support staff (secretaries, custodians, and cafeteria workers) rank next in importance and account for 6.8 percent of costs. Operations (mainly fuel and utilities) accounts for 4.0 percent. Administration at each school level accounts for 3.2 percent, and the annualized cost of equipment is 2.0 percent. None of the remaining school-specific costs exceeds 2 percent of total costs.

Overhead, which is not school-specific, accounts for 23.9 percent of costs. There are two types of overhead--system-wide and division-wide. System-wide overhead, representing costs charged to all students (such as general administration), accounts for 18.5 percent of costs. Division-wide refers to costs specific to each level (elementary, middle, or senior); it accounts for 5.4 percent of costs.

Major Cost Categories

Administrative, Teacher, and Support Staff.--The administrative, teacher, and support staff costs for each school were standardized so as to make them comparable. Table 2.1 illustrates how this was done for Sudley Elementary School. Each position is listed along with the number of employees who occupied that position during 1977-78. By standardizing costs, any pay bias due to one faculty having more experience or formal education than another was eliminated. This was necessary because such cost differences are not unique to operating YRS. Standardization was accomplished by assigning to each position the mean per diem rate associated with that position, where the mean per diem rate is based on the total number of people in that position in the Prince William system. To illustrate, the average degree and experience of all Prince William elementary school teachers is a B.A. with 8.48 years of experience. The per diem rate associated with that level of education and experience is $69.67, as shown in Table 2.1. For comparable information on the other sample schools see Appendix Tables A.3 to A.7. The same method of standardizing salaries was used for all employees, though for the administrative staff and custodians, only the annual salary was used, and for cafeteria employees a per hour figure was used. In addition, it should be noted that administrative

TABLE 2.1

STANDARDIZED EMPLOYEE COSTS FOR SUDLEY ELEMENTARY (TRADITIONAL) SCHOOL, 1977-78

Employees	No.	Days Employed	x Per Diem Rate ($) =	Annual Salary ($)	F.I.C.A. ($)	Life Ins. $7.20/$1,000/yr. ($)	Blue Cross $368.40/yr. ($)	Total Per Position ($)	Total Cost ($)
I. **Administration staff**									
Principal	1	250		23,165	1,018.06	166.75	368.40	24,718.21	24,718.21
Asst. principal	1	210		16,661	986.63	119.95	368.40	18,135.98	18,135.98
II. **Teachers**									
Elementary teachers	24	194	69.67	13,515.98	804.20	97.20	368.40	14,785.78	354,858.72
Kindergarten	2	194	62.11	12,049.34	716.94	86.40	368.40	13,221.08	26,442.16
Librarian	1	199	73.38	14,602.62	868.86	105.12	368.40	15,945.00	15,945.00
Kindergarten aide	2	188	32.32	6,076.16	361.53	43.78	368.40	6,849.87	13,699.74
III. **Support staff**									
Office secretary	1	236	34.86	8,226.96	489.50	59.26	368.40	9,144.12	9,144.12
Office secretary	1	212	34.86	7,390.32	439.72	53.21	368.40	8,251.65	8,251.65
Library secretary	1	212	34.50	7,314.00	435.18	52.63	368.40	8,170.21	8,170.21
Head custodian	1	260		10,305.42	613.17	74.16	368.40	11,361.15	11,361.15
Custodians	2	260		7,693.66	457.77	55.37	368.40	8,575.20	17,150.40
Cafe. manager II 7hr./day	1	186	4.65/hr.	6,054.30	360.23	43.56	368.40	6,826.49	6,826.49
Cafe. workers 4hr./day	2	186	3.13/hr.	2,328.72	138.56		184.20	2,651.48	5,302.96
Cafe. workers 6hr./day	2	186	3.13/hr.	3,493.08	207.84		184.20	3,885.12	7,770.24
Cafe. workers 3hr./day	1	186	3.13/hr.	1,746.54	103.92			1,850.46	1,850.46
Cafe. aide 2hr./day	1	186	3.04/hr.	1,131.00	67.29			1,198.29	1,198.29

personnel face different salary scales, depending on the calendar. This difference represents a bonus paid to the YRS administrators to compensate them for an increased work load over the same number of contract days that traditional administrators face.

The fringe benefit costs listed represent only costs incurred by the school system and not deductions from employee paychecks. The school system's or employer's share of the social security tax (F.I.C.A.) changed from 5.85 percent of the first $16,500 in 1977 to 6.05 percent of the first $17,700 in 1978. This change was allowed for by applying the 1977 tax rate to six month's worth of salary and the 1978 rate to the remaining six month's worth of salary. The tax recorded under F.I.C.A. represents the total tax paid over the twelve months of the 1977-78 school year. The employer's share of the other fringe benefits was $7.20 per $1,000 of salary for life insurance, and $368.40 per year for Blue Cross-Blue Shield health insurance. Notice that for the cafeteria employees, only the manager was eligible for full health and life insurance, whereas cafeteria workers employed four or more hours per day received one-half the health insurance benefit, and those with less than four hours per day were ineligible for either life or health insurance benefits.

The analysis examines each sample school under its current calendar and ADM, plus simulations which incorporate both the traditional and YRS calendar under several hypothetical ADMs. Adjusting a school to a simulation situation necessarily required adjusting the number of employees. Table 2.2 illustrates how the adjustments were made at Sudley Elementary School, and Appendix Tables A.8 to A.12 repeat the analysis for the other sample schools.

TABLE 2.2

STANDARDIZED EMPLOYEE COSTS, ACTUAL AND SIMULATED, FOR SUDLEY ELEMENTARY (TRADITIONAL) SCHOOL, 1977-78

Type of Employee	Actual Annual Salary and Fringe Costs Per Employee ($)	Traditional Based on Actual ADM (ADM 715.53)			YRS Simulated at Actual ADM x 1.33 (ADM 954.02)			Traditional Simulated at Capacity ADM (ADM 715)			YRS Simulated at Capacity ADM x 1.33 (ADM 953.31)		
			Cost			Cost			Cost			Cost	
		Employees Required	Total ($)	Per ADM ($)	Employees Required	Total ($)	Per ADM ($)	Employees Required	Total ($)	Per ADM ($)	Employees Required	Total ($)	Per ADM ($)
I. Principal	24,718.21	1	24,718.21	34.55	1	25,221.81	26.44	1	24,718.21	34.57	1	25,221.81	26.46
Asst. principal	18,135.98	1	18,135.98	25.35	1	21,189.01	22.21	1	18,135.98	25.37	1	21,189.01	22.23
II. Teacher by contract length													
194	14,785.78	24	354,858.72	495.94	31.66	468,117.79	490.68	23.98	354,563.00	495.89	31.64	467,822.08	490.73
194 kinder.	13,221.08	2	26,442.16	36.95				2.00	26,442.16	36.98			
230 kinder.	15,606.44				2.53	39,484.29	41.39				2.53	39,484.29	41.42
Teacher aide 230	8,297.80				3.67	31,199.73	32.70				3.67	31,199.73	32.73
Teacher aide 188	6,849.87	2	13,699.74	19.15				2	13,699.74	19.16			
Librarian	15,945.00	1	15,945.00	22.28	1	18,360.51	19.25	1	15,945.00	22.30	1	18,360.51	19.26
III. Support staff													
Office sec. 212	8,251.65	2.11	17,410.98	24.33	2.81	23,187.14	24.30	2.1	17,328.47	24.24	2.8	23,104.62	24.24
Library sec.	8,170.21	1	8,170.21	11.42	1	9,053.46	9.49	1	8,170.21	11.43	1	9 053.46	9.50
Head cust. C	11,361.15	1	11,361.15	15.88	1	11,361.15	11.91	1	11,361.15	15.89	1	11,361.15	11.92
Custodians	8,575.20	2	17,150.40	23.97	2	17,150.40	17.98	2	17,150.40	23.99	2	17,150.40	17.99
Cafe. manager II	6,826.49	1	6,826.49	9.54	1	8,701.44	9.12	1	6,826.49	9.55	1	8,701.44	9.13
Cafe. work cook/ baker 186	2,625.38	5.96	15,647.26	21.87				5.96	15,647.26	21.88			
Cafe. work cook/ baker 240	3,341.69				5.18	17,309.95	18.14				5.18	17,309.95	18.16
Cafeteria aide	1,198.29	1	1,198.29	1.67	1	1,545.81	1.62	1	1,198.29	1.68	1	1,545.81	1.62

Note: Where relevant, the Sudley actual pupil teacher ratio of 27.52 was used.

The adjustments were made under two significant assumptions. The first assumption was that the pupil teacher ratio will not change under simulation regardless of how the simulation affects the calendar and ADM. The actual pupil teacher ratio for 1977-78 at each school was used as the standard for all simulations based on that school. The basis for this assumption can be found in the insignificant difference that exists between the pupil teacher ratios of our two sample schools at each level.

The second assumption provides for consistency in the staffing patterns under simulation. The term "staffing pattern" is used to describe the management of a school as it relates to such policies as the percentage of total teacher days covered by extended contracts,[1/] and the assignment in number and by contract length of assistant principals, librarians, guidance counselors, and classified workers. The staffing pattern used for each simulation was based on that of the sample school at the same level and with the same calendar as the simulation. For example, a traditional calendar simulation of Sudley would have the same staffing pattern that Sudley actually had in 1977-78, but a YRS calendar simulation of Sudley would have the same staffing pattern that Minnieville actually had in 1977-78. There are two drawbacks to this second assumption.

[1/] An extended contract is one greater than 194 days, the typical contract length for traditional calendar teachers.

The first drawback is that the staffing pattern at any of the six sample schools might not be representative of the staffing patterns of the corresponding non-sample schools in the system. Limiting the study to six sample schools prevented confirmation of this possible problem.

A second drawback is that even though the staffing pattern used might be representative of the system, such a staffing pattern may reflect inefficient management policies. Again, proper investigation of this problem lies beyond the scope of our analysis. Both drawbacks are more likely to show up in YRS staffing patterns because of the relatively limited experience with YRS in Prince William and other school systems and the more complex management task inherent in YRS.

Staffing patterns used in the simulation were made in the following manner:

(1) For administrative staff, each school was assigned one principal and the number of assistant principals was determined according to the following system-wide based rules: (a) at the elementary school level, any school with an ADM above 570 was assigned one assistant principal; (b) at the middle school level, any school with an ADM below 1,100 was assigned one assistant principal, and any school with an ADM above 1,100 was assigned two assistant principals; (c) at the high school level, one assistant principal was assigned for each 646 of ADM under a traditional calendar with rounding to the nearest whole number. The rounding was considered more accurate than assigning fractions of assistant principals since they are not assigned on a part-time basis. A YRS high school was always assigned five assistant principals, one for each color group, plus one other.

(2) The staffing pattern of teachers was based on the percentage of total teacher days distributed among the various teacher contract lengths. Using Table 2.2 on Sudley Elementary School to illustrate, the number of teacher days assigned to 194 (contract days) teachers at a YRS elementary school was 91.34 percent of the total number of teacher days. This assignment was based on the percentage of 194 contract days that actually existed at Minnieville. Multiplying this percentage times total teacher days and dividing by 194 gives the number of teachers with 194 day contracts to be assigned to this YRS simulation of Sudley. The Sudley YRS simulation with an ADM of 954 was assigned 31.66 teachers with 194 day contracts. In this case and others that follow, the assignment of partial employees (e.g., .66 of a 194 day teacher for Sudley) was considered legitimate because of the flexibility inherent in positions which are filled by a large number of employees under varied contract lengths. If the number of teachers and other employees were rounded off to whole numbers, the resulting effects on staff costs overall would be minor. No adjustment was made for the fact that extended contract teachers have fewer in-service days than regular teachers. Conceptually, a YRS simulation should adjust for this fact by requiring a smaller number of teacher days for an equivalent ADM. The two principal reasons for not making such an adjustment were: (a) the number of in-service days for each contract period appears to vary among schools and programs; and (b) in the case of our sample YRS schools, a substantial percentage of the teachers were not on extended contracts.[1/]

[1/] The following percentages of teachers were not on extended contracts: Minnieville Elementary (93 percent); Graham Park Middle (48 percent); and Woodbridge Senior High (55 percent).

(3) Other employees that were assigned by essentially the same manner as teachers include guidance counselors, teacher aides, library and guidance secretaries at the senior high level, and cafeteria workers.

(4) Office secretaries were assigned on a per pupil basis.

(5) Custodians were assigned on a per building square foot basis, which is the actual method of assignment employed by Prince William County.

(6) Some employees were primarily assigned on a per level basis (elementary, middle, and senior), allowing for a different contract length to reflect the type of calendar. Employees assigned in this manner include librarians, bookkeepers, administrative secretaries, cafeteria managers, building engineers, and library and guidance secretaries below the high school level.

(7) One final assignment was the coaching supplement which is based on actual cost. This cost, however, is more a function of the sports offered at the schools than anything else, and therefore it was held constant at each school under all simulations.

Substitute Teacher Costs.--One of the criticisms of YRS is that the cost of substitute teachers will be greater than under a comparable traditional program. This implies that total leave days as a percentage of total teacher days will be larger for YRS. There are three possible reasons for this expected result: (1) Teachers on extended contracts in YRS may begin to "burn out" or tire at an accelerated rate after a short period of time. This could lead to more illness and therefore more substitute costs. (2) Because extended contract teachers have fewer in-service days, it may be necessary for them to use substitutes more often. (3) A YRS schedule may impose restrictions on teachers that would make it difficult for them to schedule other activities that were traditionally undertaken during the summer. Consequently, under YRS, teachers may be forced to take more leave to accommodate these activities.

In Table 2.3 we examined these propositions by comparing substitute days as a percentage of total teacher days for YRS and traditional schools. Using a three year average of the sum total of all schools under each calendar, random variations were minimized. Random variations represent deviations from the norm, which occur randomly and without regard to the school calendar. Averaging helps eliminate bias due to random variations by permitting upward variations to cancel downward variations. The resulting totals showed YRS schools to have substitute days equal to 9.3 percent of total teacher days and traditional schools to have substitute days equal to 5.6 percent of total teacher days. Substitute days as a percentage of total teacher days were 66 percent higher under YRS than under a traditional calendar. This evidence supports the argument that substitute teacher costs will be higher under YRS. Of the three possible explanations for this result, no support could be found for the idea that teachers under extended contracts tend to tire at an accelerated rate or to use substitutes more frequently because of the lack of in-service days. If this had been true, the two YRS schools with a large number of teachers under extended contracts (Graham Park and Woodbridge) would have had a higher percentage of substitute days than the YRS school with few extended contracts (Minnieville). Reference to Table 2.3 confirms that this did not occur. However, it should be noted that Graham Park and Woodbridge had only been under YRS for two years, a period which may not have been long enough for the fatigue factor to appear. Explanation of the observed increase in substitute days under YRS must therefore rely on the other reason, which points to other time scheduling difficulties of teachers in the YRS program.

TABLE 2.3

SUBSTITUTE DAYS AT YEAR-ROUND AND TRADITIONAL SCHOOLS, 1975-76 TO 1977-78

	1975-76		1976-77		1977-78		Three Year Average	
	Absolute Number	Sub. Days as % of Teacher Days	Absolute Number	Sub. Days as % of Teacher Days	Absolute Number	Sub. Days as % of Teacher Days	Absolute Number	Sub. Days as % of Teacher Days
Sudley								
Sub. days	344.5	6.3	291.5	5.2	384.7	7.6	340.2	6.4
Teacher days	5,441.1		5,558.2		5,044.1		5,347.8	
Marsteller								
Sub. days	483.5	4.5	566.0	6.2	694.9	8.2	581.5	6.1
Teacher days	10,761.0		9,126.4		8,500.5		9,462.6	
Stonewall Jackson								
Sub. days	1,015.0	5.3	978.0	5.3	910.1	4.7	967.7	5.1
Teacher days	19,204.5		18,567.8		19,416.9		19,063.1	
Total trad.								
Sub. days	1,843.0		1,835.5		1,989.9		1,889.5	
Teacher days	35,406.6	5.6	33,252.4	5.5	32,961.5	6.0	33,873.5	5.6
Minnieville								
Sub. days	538.0	8.0	548.0	8.9	569.8	10.7	551.9	9.1
Teacher days	6,763.2		6,184.1		5,310.7		6,086.0	
Graham Park								
Sub. days	673.5	8.0[a]	751.0	8.6	739.0	8.2	745.0	8.4
Teacher days	8,382.7		8,720.7		9,029.8		8,875.3	
Woodbridge								
Sub. days	1,477.5	5.1[a]	2,674.0	8.8	3,255.3	10.4	2,964.7	9.6
Teacher days	29,011.7		30,470.7		31,217.4		30,844.1	
Total YRS								
Sub. days	538.0		3,973.0		4,564.1		3,025.0	
Teacher days	6,763.2	8.0	45,375.5	8.8	45,557.9	10.0	32,565.5	9.3
Ratio of total YRS % sub. days to total traditional % sub. days		1.53		1.60		1.67		1.66

---

a/ This year was excluded from the analysis because the school was under a traditional calendar in 1975-76.

Translation of the substitute days into costs is shown in Table 2.4. The standards used for substitute days as a percentage of total teacher days were 5.6 percent for all (actual and simulated) traditional cases and 9.3 percent for all YRS cases. These numbers were used for all respective calendar cases in order to standardize the costs among the cases and control for what may be random differences among the schools. The $20 cost per substitute day is the amount that Prince William paid most substitute teachers in 1977-78. Substitutes who replace a teacher for an extended period of time are compensated on the basis of their education and experience. However, we assumed that instances of extended substituting are rare, so that most of the substitutes received the $20 per day rate.

Facilities (Buildings) and Equipment.--In business accounting, buildings and equipment are depreciated over their useful lives. However, depreciation is not commonly charged in government accounting except in the case of enterprise funds. The usual government practice is to charge the entire cost of acquiring an asset to the year of purchase. This implies that the cost of using the asset during the remaining years of its useful life is zero. However, if someone wanted to use a capital asset over several years and did not own it, he would certainly be willing to pay an annual rent. This shows that the true economic cost of a capital asset over its useful life can never be zero. Therefore, spreading the cost of a capital asset over its useful life is the most accurate way to assign its true economic cost.

Another consideration in estimating annual capital costs is the method of financing. Prince William County typically finances its capital outlays with bonds. The interest cost of this borrowing must therefore be added to capital costs.

TABLE 2.4

SUBSTITUTE TEACHER COSTS, 1977-78

	Traditional Teacher Days Based on Actual ADM	x 5.6% Equals Sub. Days	x $20 Equals Sub. Costs ($)	YRS Teacher Days Simulated at Actual ADM x 1.33	x 9.3% Equals Sub. Days	x $20 Equals Sub. Costs ($)	Traditional Teacher Days Simulated at Capacity ADM	x 5.6% Equals Sub. Days	x $20 Equals Sub. Costs ($)	YRS Teacher Days Simulated at Capacity ADM x 1.33	x 9.3% Equals Sub. Days	x $20 Equals Sub. Costs ($)
Sudley												
Total	5,044.1	282.5	5,650.0	6,725.3	625.5	12,510.0	5,040.3	282.3	5,646.0	6,720.3	625.0	12,500.0
Per ADM			7.90			13.10			7.90			13.10
Marsteller												
Total	8,500.5	476.0	9,520.0	11,333.7	1,054.0	21,080.0	9,593.4	537.2	10,744.0	12,790.9	1,189.6	23,792.0
Per ADM			11.40			18.90			11.40			18.90
S. Jackson												
Total	19,416.9	1,087.3	21,746.0	25,888.6	2,407.6	48,152.0	21,410.1	1,199.0	23,980.0	28,546.1	2,654.8	53,096.0
Per ADM			10.50			17.40			10.50			17.40

	YRS Teacher Days Based on Actual ADM	x 9.3% Equals Sub. Days	x $20 Equals Sub. Costs ($)	Traditional Teacher Days Simulated at Actual ADM x .75	x 5.6% Equals Sub. Days	x $20 Equals Sub. Costs ($)	YRS Teacher Days Simulated at Capacity ADM x 1.33	x 9.3% Equals Sub. Days	x $20 Equals Sub. Costs ($)	Traditional Teacher Days Simulated at Capacity ADM	x 5.6% Equals Sub. Days	x $20 Equals Sub. Costs ($)
Minnieville												
Total	5,310.7	493.9	9,878.0	3,983.1	223.1	4,462.0	6,606.1	614.4	12,288.0	4,954.7	227.5	5,550.0
Per ADM			13.00			7.80			13.00			7.80
Graham Park												
Total	9,029.8	839.8	16,796.0	6,772.3	379.2	7,584.0	12,511.3	1,163.6	23,272.0	9,383.7	525.5	10,510.0
Per ADM			19.60			11.80			19.60			11.80
Woodbridge												
Total	31,217.4	2,903.2	58,064.0	23,413.1	1,311.1	26,222.0	29,554.0	2,748.5	54,970.0	22,166.1	1,241.3	24,826.0
Per ADM			17.30			10.40			17.30			10.40

To estimate annual capital costs, assumptions had to be made concerning the average life of capital assests. The average life of buildings was assumed to be twenty-five years. This assumption incorporated both physical deterioration and obsolescence of building design. According to Mr. J. Crosswhite, Construction Supervisor, Prince William County Schools, deterioration alone would account for a twenty year expected life of utility equipment and the roof and a fifty year expected life of the building walls.

Other sources that recommended spreading the cost of buildings over twenty to thirty year period were George W. Holmes, III, John P. Hamill and Philip S. Schaenman and Thomas Muller. Holmes, who is a professor in the Department of Administration and Supervision, School of Education, University of Virginia, observed, Educationally, a building will be obsolete in twenty years. In twenty to thirty years it will need a major renovation."[1] Hamill, who is Supervisor of School Buildings, Virginia Department of Education, stated that building life is a very indefinite concept. The life of a building depends on the quality of original construction, the adaptability of the structure, and community preferences concerning renovation. As a general rule, Hamill recommended the use of the bond maturity, which in Virginia is generally twenty years.[2] Schaenman and Muller, authors of a widely used publication on community impact analysis, recommend a twenty to thirty year period.[3]

The average life of furnishings and equipment was assumed to be nine years. This estimate was provided by Richard Fitzsimmons, Inventory Specialist for Prince William County Schools. Mr. Fitzsimmons did not hesitate to point out, however, that this assumption includes much variation since the type of equipment, and make or quality may greatly alter its expected life. Implicit in this analysis is the assumption that the expected life of furnishings and equipment is more dependent on the factors of obsolescence, management, vandalism, and physical deterioration than student use. This assumption also applies to building life.

---

[1] Interview, August 4, 1978.
[2] Interview, August 4, 1978.
[3] Philip S. Schaenman and Thomas Muller, Measuring Impacts of Land Development (Washington, D.C.: The Urban Institute, 1974), pp. 50-52.

The interest cost was based on the assumption of a 5.3 percent annual charge on outstanding debt. This charge is the February 1978 average interest rate for municipal bonds sold with a Moody's Aa rating, the rating of the school bonds most recently sold by Prince William County.

The procedure for calculating annualized capital costs requires the use of a current dollar cost for each asset. The conversion of original costs to current dollars eliminates any distortions in cost figures of different years which may be due to inflation. Thus, converting all original costs to current dollars permits a true comparison of these costs among each other and with operating costs incurred during the current year.

Two options were available for converting the original costs into current dollars. The first option was to simply multiply the original cost by an inflation index. This was done for facilities (buildings), taking into account all additions and inflating from the date of completion. The results of this calculation are presented in the first column of Table 2.5. The second option was to use the current appraised insurance value of each asset as its current dollar cost. This insured value represents 100 percent replacement cost, and it is based on the current cost per square foot of building an elementary, middle, or senior high school. The insured values are presented in the second column of Table 2.5.

Comparing the first two columns of Table 2.5 reveals a difference

TABLE 2.5

BUILDING AND EQUIPMENT COSTS, 1977-78[1]

		Insured Value					
				Cost Per ADM			
	Original Cost in Current $	Total Cost ($)	Annualized Cost ($)	Traditional Based on Actual ADM	YRS Simulated at Acutal ADM x 1.33	Traditional Simulated at Capacity ADM	YRS Simulated at Capacity ADM x 1.33
Traditional Schools							
Sudley							
Facilities	1,994,428.00	1,776,438.00	129,858.98	181.49	136.12	181.62	136.22
Equipment		131,814.00	18,793.47	26.27	19.70	26.28	19.71
Marsteller							
Facilities	3,353,039.90	3,367,956.00	246,200.17	294.03	220.52	260.53	195.40
Equipment		264,718.00	37,742.35	45.07	33.81	39.94	29.95
Stonewall Jackson							
Facilities	13,281,205.50	10,921,000.00	798,333.49	384.40	228.31	348.62	261.47
Stadium		373,900.00	27,332.38	13.16	9.87	11.94	8.95
Equipment		840,287.00	119,804.49	57.69	43.27	52.32	39.24
				YRS Based on Actual ADM	Traditional Simulated at Actual ADM x .75	YRS Simulated at Capacity ADM 1.33	Traditional Simulated at Capacity ADM
YRS Schools							
Minnieville							
Facilities	2,218,023.70	1,776,438.00	129,858.98	170.64	227.52	137.18	182.90
Equipment		119,014.00	16,968.50	22.30	29.73	17.92	23.90
Graham Park							
Facilities	4,177,171.62	3,340,400.00	244,185.81	285.12	380.16	205.78	274.37
Equipment		202,256.00	28,880.70	33.73	44.96	24.34	32.45
Woodbridge							
Facilities	12,418,905.10	11,740,946.00	858,272.17	256.06	341.41	270.47	360.62
Stadium		374,700.00	27,390.86	8.17	10.90	8.63	11.51
Equipment		917,559.00	130,821.60	39.03	52.04	41.23	54.97
System-wide overhead					Per System-wide ADM (36,092.92)		
Facilities		4,153,100.00	303,594.80		8.41		
Equipment		2,401,100.00	342,338.46		9.48		

---

[1] Equipment costs include furniture costs.

in the results achieved under each of the two methods. Table 2.6 below presents a different approach to the same comparison.

TABLE 2.6

CURRENT DOLLAR VALUE OF ORIGINAL COST
AS A PERCENT OF INSURED VALUE, 1977-78

Traditional	Percent	YRS	Percent
Sudley	112	Minnieville	125
Marsteller	100	Graham Park	125
Stonewall Jackson	122	Woodbridge	106

Here it can be seen that in almost every case the original cost in current dollars is significantly greater than the insured value. The only exception is Marsteller Middle School, and the explanation for that exception highlights one of the major differences in the two approaches. Marsteller is the only sample school that is not air-conditioned, and its original cost will naturally reflect that fact. However, the insured value for Marsteller and all the schools includes air conditioning as part of the 100 percent replacement cost. Therefore, by either adding the cost of air conditioning to Marsteller's original cost, or subtracting the air conditioning from Marsteller's insured value, the adjusted figure for Marsteller would become close to the others.

Finally, even though the original cost method generated higher values, the relative differences are not at all consistent. The relative differences ranged from 25 percent for Minnieville and Graham Park to only 6 percent higher for Woodbridge (excluding Marsteller because of the air conditioning discrepancy). This implied that one of the two methods provided less consistent results than the other.

We decided that the original cost method provided the least reliable estimates for two reasons. First, the original cost method used an inflation index which represented national price movements. National price movements may vary significantly from local price movements for short periods of time. Second, the construction of a school may take one to two years, making it difficult to select one date as a base for inflation adjustment. The insured value approach does not involve these problems since it is derived from current year cost estimates. Therefore, the decision was made to use the insured value approach. One source that also recommended the insured value approach was the Virginia Department of Education.[1/]

Using the assumptions outlined above, the annualized cost of capital was derived from the following formula:

$$ACC=IV\left(\frac{1-(1+i)^{-n}}{i}\right)^{-1}$$

where ACC is the unknown variable, the annualized capital cost; IV is the insured value; i is the interest rate (5.3 percent); and n is the average lifetime of the item (25 years for buildings and 9 years for furnishings and equipment).

This formula provides the equal annual payments required to cover interest and bond redemption over the bond period. We recognize that Prince William bond issues are generally not retired in equal payments, yet this method provides a better measure of true economic cost.

Table 2.5 presents the annualized capital costs both as a total and per ADM. It should be noted that stadium costs were annualized over an expected life of twenty-five years, the same as for buildings. System-wide overhead refers to the annualized capital costs of buildings and equipment used by the Prince William County School Administration.

1/ "Annual School Report Instructions for Statistical Section" (June 1978), p. 16.

Operations Costs. — Operations costs were subdivided into three groups: energy costs, other operating costs, and telephone costs. The energy costs group will be dealt with first since it is the most significant cost group of the three.

Energy costs include the cost of electricity, gas, and oil for the purposes of heating and cooling primarily, but also for lighting, cooking, and other general uses. Table 2.7 shows the actual energy costs of the sample schools for 1977-78, including an adjustment for different calendar simulations. Examination of the per ADM costs under the actual ADM of the six schools reveals no pattern that would allow one to make any generalizations. This result is easily explained, however, with reference to Table 1.2 in Chapter 1. Focusing on the heating and cooling system information, we see that only the two elementary schools have comparable systems, and there is even a problem in comparisons between them as one school heats primarily with gas and the other with oil.

Another difficulty in comparing the schools arises from the fact that the schools face utility price structures which vary by location. For example, there are two electric companies which service Prince William County Schools, and each company charges one of two different rates to each school depending on the school's location. A school may therefore face any one of four different rates. In addition, these rates varied from 1¢ per kwh to more than 2¢ per kwh in 1977-78. This rate variation alone may explain much of the energy cost difference between Woodbridge and Stonewall Jackson as seen in Table 2.7. In the future, when utility rates are renegotiated, this disparity may be reduced significantly.

TABLE 2.7

ACTUAL UTILITY COSTS, 1977-78

School	Electricity Costs ($)	Oil Costs ($)	Gas Costs ($)	Total Utility ($)	x 1.33 for Comparable YRS Costs ($)	Per ADM ($)			
						Traditional Based on Actual ADM	YRS Simulated at Actual ADM x 1.33	Traditional Simulated at Capacity ADM	YRS Simulated at Capacity ADM x 1.33
Traditional									
Sudley	26,784.39	23,374.94	970.26	51,129.59	68,171.08	71.46	71.46	71.51	71.51
Marsteller	22,469.36	20,519.35	2,214.34	45,203.05	60,269.23	53.98	53.98	47.83	47.83
Stonewall Jackson	161,795.36	58,242.71	1,502.83	221,540.90	295,380.48	106.67	106.67	96.74	96.74
					x .75 for Comparable Traditional Costs	YRS Based on Actual ADM	Traditional Simulated at Actual ADM x .75	YRS Simulated at Capacity ADM x 1.33	Traditional Simulated at Capacity ADM
YRS									
Minnieville	34,015.02	43,247.28	478.33	77,740.63	58,305.47	102.15	102.15	82.12	82.12
Graham Park	18,735.48	19,131.82	1,974.23	39,841.53	29,881.15	46.52	46.52	33.58	33.58
Woodbridge	99,536.92		549.49	100,086.41	75,064.81	29.86	29.86	31.54	31.54

Because of the incomparability of the actual data, a method to standardize energy costs had to be employed. Several key assumptions were made in order to standardize energy costs. The first concerned the cost of heating versus cooling. If it were more expensive, on the average, to cool a building for a month, than to heat the same building for a month, then energy costs per ADM would be higher for a YRS program, assuming full utilization of capacity under both calendars. Conversely, if it is cheaper to cool than to heat the building, then energy costs per ADM would be higher for a traditional program.

In Prince William County, we could find no apparent difference between the cost of heating and cooling. Comparing the energy consumption of the two all-electric senior high schools under YRS (Woodbridge and Gar-Field) in Table 2.8, no apparent difference between average monthly electricity consumption for winter months and summer months can be discerned. All fluctuations in energy consumption correspond highly with random variations in weather, which, when accounted for, would bring the cooling values as a percent of heating values close to 100 percent. This indicates no difference between heating and cooling costs. The weather descriptions in Table 2.8 are based on a thirty year average for degree heating days of 4,211 (seasonal) and a three year average for degree cooling days of 1,657 (seasonal).1/

This result does conflict with an energy consumption comparison prepared for Prince William by Dr. E. H. Mueller.2/ He found that energy costs were 20 percent lower in cooling months; however, it was not apparent

---

1/ All data were collected at National Airport for the Washington, D.C. area. The 30 year average was taken from U.S. Bureau of the Census, Statistical Abstract of the United States: 1977 (Washington, D.C.: Government Printing Office, 1977), p. 219. The 3 year average was derived from available data.

2/ Ernest H. Mueller, "Energy Consumption Comparison" (April 1974).

TABLE 2.8

FUEL CONSUMPTION ANALYSIS FOR HEATING AND COOLING, 1975-76 TO 1977-78

	Electricity Consumption						
	Heating Months		Cooling Months				
	9 Month Avg. (kwh)	8 Month Avg. (kwh)	3 Month Avg. (kwh)	4 Month Avg. (kwh)	Cooling as % of Heating	Winter Weather Description (Degree Heating Days)	Summer Weather Description (Degree Cooling Days)
Woodbridge 77-78	730,226.78		798,028.67		109.29	Cold Winter (4,000)b/	Very Hot Summer (1,762)
Woodbridge 77-78		730,035.13		781,461.50	107.04		
Gar-Field 77-78							
Gar-Field 77-78							
Woodbridge 76-77	754,155.78		677,620.00		89.85	Very Cold Winter (4,438)	Mild Summer (1,554)
Woodbridge 76-77		776,269.00		652,527.50	84.06		
Gar-Field 76-77	836,586.00		716,134.67		85.60	Very Cold Winter (4,438)	Mild Summer (1,554)
Gar-Field 76-77		854,358.75		710,702.00	83.19		
Woodbridge 75-76	628,380.22		561,762.67		89.40	Warm Winter (3,413)	Hot Summer (1,654)
Woodbridge 75-76		638,605.25		557,967.00	87.37		
Gar-Field 75-76	671,592.67		577,027.33		85.92	Warm Winter (3,413)	Hot Summer (1,654)
Gar-Field 75-76		695,524.38		552,805.25	79.48		

---

a/ The summer degree cooling days are for the months May through September. For example, 1977-78 is based on May through September 1977.

b/ Estimated from data through January 1978.

that he had controlled adequately for weather. Our result also differs from the Turnkey study, which observed, "analysis indicated that it costs about twice as much to heat a building for a month as it does to cool it for a month."[1/] Since the Turnkey study provided no documentation for this statement, there is no basis for checking its validity.

Besides weather, there are numerous other variables involved which might never be adequately controlled for. These include such factors as building landscape, building exposure, daily population in the building, insulation, the amount of entering and exiting traffic, utilization of window blinds, monitoring of opened doors and windows, relative efficiency of heating and cooling apparatus, and changes in thermostat settings in reaction to cost and availability of energy (e.g., the fuel crises during the 1976-77 winter affected availability of certain fuels). The net effect of these variables is indeterminate in size and direction. Still another consideration is the extent to which a traditional school might be cooled in the summer. Areas cooled could easily range from just the administrative offices to very large sections of the building because of custodial and maintenance employees working in those sections. Certainly, the more cooling needed or desired under a traditional operation, the lower would be any additional total cost of cooling under YRS operation.

Standardized energy costs are presented in Table 2.9. In this table we use the same energy cost in every month, but traditional calendar schools are only charged for nine months while YRS schools are charged for twelve months. This implies that total annual energy costs will be 33 percent higher for a school under YRS operation than for the same school under traditional operation.

[1/] Curry and Sweeney, 45-15 and the Cost of Education, p. 26.

9

TABLE 2.9

STANDARDIZED ENERGY COSTS, 1977-78

		Total								All Energy Costs Per ADM			
		Electricity Cost[a/]		Oil Cost[b/]		Gas Cost[c/]		All Energy Costs					
School	Total Gross Square Feet	Traditional ($)	YRS ($)	Traditional ($)	YRS ($)	Traditional ($)	YRS ($)	Traditional ($)	YRS ($)	Traditional Based on Actual ADM ($)	YRS Simulated at Actual ADM x 1.33 ($)	Traditional Simulated at Capacity ADM ($)	YRS Simulated at Capacity ADM x 1.33 ($)
Traditional													
Sudley	53,028	16,555.34	22,075.56	5,981.56	7,975.41	1,521.90	2,030.97	24,058.80	32,081.94	33.62	33.63	33.65	33.65
Marsteller	100,536	31,887.34	41,853.14	11,340.46	15,120.61	2,885.38	3,850.53	45,613.18	60,824.28	54.47	54.48	48.27	48.27
Stonewall Jackson	326,000	101,777.20	135,713.80	36,772.80	49,030.40	9,356.20	12,485.80	147,906.20	197,230.00	71.22	71.23	64.59	64.60
										YRS Based on Actual ADM ($)	Traditional Simulated at Actual ADM x .75 ($)	YRS Simulated at Capacity ADM x 1.33 ($)	Traditional Simulated at Capacity ADM ($)
YRS													
Minnieville	53,028	16,555.34	22,075.56	5,981.56	7,975.41	1,521.90	2,030.97	24,058.80	32,081.94	42.16	42.15	33.89	33.89
Graham Park	99,708	31,128.84	41,508.44	11,247.06	14,996.08	2,861.62	3,818.82	45,237.52	60,323.34	70.44	70.43	50.84	50.83
Woodbridge	350,476	109,418.61	145,903.16	39,533.69	52,711.59	10,058.66	13,423.23	159,010.96	212,037.98	63.26	63.25	66.82	66.81

a/ Based on a systemwide cost per square foot per month of $0.347 where traditional is charged for 9 months and YRS is charged for 12 months.

b/ Based on a systemwide cost per square foot per month of $.0125 where traditional is charged for 9 months and YRS is charged for 12 months.

c/ Based on a systemwide cost per square foot per month of $.0032 where traditional is charged for 9 months and YRS is charged for 12 months.

In order to standardize energy costs, a system-wide cost per square foot for each type of fuel was applied to each school. The system-wide annual cost per square foot was converted into a monthly cost to facilitate application of the monthly charges.[1/]

While the standardized energy costs presented in Table 2.9 are adjusted for calendar, they include no adjustments for ADM. Although it is reasonable to assume that the number of people in a building will affect energy consumption, the variations in ADM among a particular school's simulations were for the most part insignificant and would have resulted in only minor adjustments to the energy costs. Even if such an adjustment were desirable, we were unable to find a well-defined method for doing so.

Other operations costs are presented in Table 2.10. They include water, sewer, trash, and a category labeled "other costs" which includes expenditures on exterminating, gym floors, rug shampoo, and operations supplies and equipment. For many of the same reasons that energy costs were standardized, other operations costs were standardized as well. The standardization was done by simply determining a cost per ADM on a system-wide basis. This was conducted over a three year period to check for a pattern. No pattern was detected among the individual categories, though the per ADM costs increased over the years, reflecting

---

1/ We used the following formula to derive the standardized utility costs per month denoted as x:

$(\%\ \text{sq.ft. traditional})(9x) + (\%\ \text{sq.ft. YRS})(12x) = \text{system-wide cost per sq. ft.}$

The numbers 9 and 12 refer to the months applicable. Substituting actual values:

$.404(9x) + .596(12x) = \text{system-wide cost per sq. ft.}$

Therefore, $x = \text{system-wide cost per sq. ft.} \div 10.79$. Note the calculation of % sq. ft. was based on the rated capacity existing under each mode since this figure was considered to incorporate both actual square feet and estimated design utilization.

TABLE 2.10

OTHER OPERATIONS COSTS, 1977-78

	1975-76 (ADM, 40,515.21) ($)	1976-77 (ADM 39,352.91) ($)	1977-78 (ADM 36,096.92) ($)
Water			
Total	50,896.23	84,343.56	69,742.45
Per ADM	1.26	2.14	1.93
Sewer			
Total	81,288.27	135,014.24	108,187.45
Per ADM	2.01	3.43	3.00
Trash			
Total	45,988.00	46,872.00	49,585.24
Per ADM	1.14	1.19	1.37
Other costs[a]			
Total	183,935.88	161,800.50	172,931.05
Per ADM	4.54	4.11	4.79
Total	362;108.38	428,030.30	400,466.10
Per ADM	8.59	10.87	11.09

---

[a] Includes supplies, equipment, extermination, gym floor, and rug shampoo.

general price increases. Therefore, we decided to rely on 1977-78 data as they incorporated the most recent prices.

The decision to standardize in this manner was based on the observation that most of these costs are primarily a function of ADM. Exterminating costs are certainly an exception to this rule, however. These costs are a function of a building's age, location, and quality, variables we were not able to control for. Due to the small dollar amount involved, the decision to standardize exterminating costs on the basis of ADM causes no significant distortion.

Telephone costs are shown in Table 2.11. They are based on monthly data provided by the School Operations Department adjusted to the June 1978 monthly rate. These data represent total outlays whereas the series available from the Department of Fiscal Planning, Management, and Control shows only net costs, after deductions of amounts paid from school activity funds. The same total cost for each school was applied for all simulations of that school. This procedure was based on the assumption that telephone expenses would vary insignificantly with a calendar change and/or an ADM change within the magnitudes of our cases. This assumption appears reasonable in view of the fact that a majority of the monthly bill reflects the fixed charge on telephone service. The variable component, which is due to long-distance calls, is less important. Furthermore, the schools are in the process of installing Metro lines which will further reduce the variable component of the monthly bill.

Operations costs are summarized in Table 2.12 where all three cost groups are brought together to give total operations cost.

TABLE 2.11

TELEPHONE COSTS, 1977-78

School	Annual[a] Total Cost ($)	Per ADM Traditional Based on Actual ADM ($)	YRS Simulated at Actual ADM x 1.33 ($)	Traditional Simulated at Capacity ADM ($)	YRS Simulated at Capacity ADM x 1.33 ($)
Traditional					
Sudley	1,491.60	2.08	1.56	2.09	1.56
Marsteller	3,362.40	4.02	3.01	3.56	2.67
Stonewall Jackson	7,636.8	3.68	2.76	3.33	2.50
		YRS Based on Actual ADM ($)	Traditional Simulated at Actual ADM x .75 ($)	YRS Simulated at Capacity ADM x 1.33 ($)	Traditional Simulated at Capacity ADM ($)
YRS					
Minnieville	1,329.60	1.75	2.33	1.40	1.87
Graham Park	3,295.20	3.85	5.13	2.78	3.70
Woodbridge	7,449.00	2.22	2.96	2.35	3.13

---

[a] Based on the July 1978 monthly rate which is an approximation of an average gross monthly cost.

TABLE 2.12

TOTAL OPERATIONS COSTS, 1977-78

School cost	Traditional Based on Actual ADM ($)	YRS Simulated at Actual ADM x 1.33 ($)	Traditional Simulated at Capacity ADM ($)	YRS Simulated at Capacity ADM x 1.33 ($)
Traditional				
Sudley				
Energy costs	33.62	33.63	33.65	33.65
Other costs	11.09	11.09	11.09	11.09
Telephone	2.08	1.56	2.09	1.56
Total	46.79	46.28	46.83	46.30
Marsteller				
Energy costs	54.47	54.48	48.27	48.27
Other costs	11.09	11.09	11.09	11.09
Telephone	4.02	3.01	3.56	2.67
Total	69.58	68.58	62.92	62.03
Stonewall Jackson				
Energy costs	71.22	71.23	64.59	64.60
Other costs	11.09	11.09	11.09	11.09
Telephone	3.68	2.76	3.33	2.50
Total	85.99	85.08	79.01	78.19
	YRS Based on Actual ADM	Traditional Simulated at ADM x .75	YRS Simulated at Capacity ADM x 1.33	Traditional Simulated at Capacity ADM
YRS				
Minnieville				
Energy costs	42.16	42.15	33.89	33.89
Other costs	11.09	11.09	11.09	11.09
Telephone	1.75	2.33	1.40	1.87
Total	55.00	55.57	46.38	46.85
Graham Park				
Energy costs	70.44	70.43	50.84	50.84
Other costs	11.09	11.09	11.09	11.09
Telephone	3.85	5.13	2.78	3.70
Total	85.38	86.65	64.71	65.63
Woodbridge				
Energy costs	63.26	63.25	66.82	66.81
Other costs	11.09	11.09	11.09	11.09
Telephone	2.22	2.96	2.35	3.13
Total	76.57	77.30	80.26	81.03

Maintenance Costs. — Maintenance costs are presented in Table 2.13. A three year average was used to adjust for random variations. Past years had to be adjusted for inflation to bring each year's costs in line with a current dollar figure.[1/]

The three-year average in current dollars represents a total maintenance cost assigned to each school. The total cost remains the same for a particular school regardless of any calendar or ADM changes occurring in the simulations. The support for the assumption that maintenance is more a function of building size than calendar or ADM comes from the fact that actual maintenance costs do not appear to be affected by calendar or ADM. For example, in 1975-76 Graham Park and Woodbridge were both traditional, yet maintenance costs in that year did not differ significantly from the years 1976-77 and 1977-78 when the two schools were YRS.

One reservation must be mentioned in regard to the above assumption. In our analysis, we could only deal with costs that were actually incurred. An often mentioned criticism of YRS is that the schools do not have long enough periods of down time to permit major maintenance functions. Therefore, even if YRS should lead to a greater need for maintenance, it would not show up as added costs if the maintenance were not conducted. If this were true, one would expect to see YRS maintenance costs even lower than traditional costs. However, by referring to Table 2.13, it can be seen that maintenance costs under YRS were not significantly less than

---

[1/] Supplies were adjusted using the maintenance and repairs component of the consumer price index. Salaries were adjusted using the Bureau of Labor Statistics series on average weekly earnings of nonsupervisory workers in contract construction. Work contracted out was adjusted using a simple average of the other two indexes since work contracted out is composed of both labor and materials components.

TABLE 2.13

MAINTENANCE COSTS, 1977-78

Traditional	1975-76 Actual ($)	1975-76 Inflation Index (%)	1975-76 Current ($)	1976-77 Actual ($)	1976-77 Inflation Index (%)	1976-77 Current ($)	1978 Current ($)	3 Year Avg. in Current ($)	All Maintenance Costs Per ADM ($): Traditional Based on Actual ADM	YRS Simulated at Actual ADM x 1.33	Traditional Simulated at Capacity ADM	YRS Simulated at Capacity ADM x 1.33
Sudley												
Supplies	4,409.21	114.87	5,064.86	6,598.58	107.23	7,7075.66	5,623.90	5,921.47				
Salaries	6,400.10	109.22	6,990.19	10,049.60	103.81	10,432.49	8,595.11	8,672.60				
Contracted out	4,302.00	112.05	4,820.39	4,030.00	105.52	4,252.46	6,065.15	5,046.00				
Total								19,640.07	27.45	20.59	27.47	20.60
Marsteller												
Supplies	8,302.93	114.87	9,537.58	7,656.10	107.23	8,209.64	5,849.74	7,865.65				
Salaries	10,793.34	109.22	11,788.49	15,630.15	103.81	16,225.66	8,663.91	12,226.02				
Contracted out	488.73	112.05	547.62	481.83	105.52	508.43	3,946.47	1,667.51				
Total								21,759.18	25.99	19.49	23.03	17.27
Stonewall Jackson												
Supplies	26,278.34	114.87	30,185.93	16,430.75	107.23	17,618.69	19,327.69	22,377.44				
Salaries	23,874.90	109.22	26,076.17	21,486.85	103.81	22,305.50	20,373.31	22,918.33				
Contracted out	11,275.93	112.05	12,634.68	11,416.64	105.52	12,046.84	9,045.23	11,242.25				
Total								56,538.02	27.22	20.42	24.69	18.52
YRS									YRS Based on Actual ADM	Traditional Simulated at Actual ADM x .75	YRS Simulated at Capacity ADM x 1.33	Traditional Simulated at Capacity ADM
Minnieville												
Supplies	3,789.44	114.87	4,352.93	4,597.62	107.23	4,930.03	5,409.24	4,897.40				
Salaries	8,077.01	109.22	8,821.71	9,616.30	103.81	9,982.68	8,605.10	9,136.50				
Contracted out	1,241.96	112.05	1,391.62	586.00	105.52	618.35	7,374.44	3,128.14				
Total								17,162.04	22.55	30.07	18.13	24.17
Graham Park												
Supplies	7,159.75	114.87	8,224.40	9,723.79	107.23	10,426.82	9,920.73	9,523.98				
Salaries	8,751.90	109.22	9,558.83	14,673.75	103.81	15,232.82	12,108.19	12,299.95				
Contracted out	609.94	112.05	683.44	671.29	105.52	708.35	3,714.41	1,702.07				
Total								23,526.00	27.47	36.63	19.83	26.43
Woodbridge												
Supplies	17,714.81	114.87	20,349.00	33,751.05	107.23	36,191.25	25,831.86	25,831.86				
Salaries	25,381.45	109.22	27,721.62	32,000.95	103.81	33,220.19	25,382.71	25,382.71				
Contracted out	1,295.55	112.05	1,451.66	1,178.09	105.52	1,243.12	896.80	896.80				
Total								57,429.40	17.13	22.84	18.10	24.13

under traditional, especially for Graham Park and Woodbridge which changed calendars after 1975-76.

Other Instructional Costs. -- This category of costs includes such items as erasers, chalk, etc. A detailed listing of these costs by location was obtained from Prince William County Schools. A per ADM cost per school was derived using actual costs and actual ADM at each school. This per ADM cost was then assigned to the simulations of each school without adjustment. No adjustment was made because there is no reason why these costs per ADM would change with either a calendar or ADM change. Presentation of these costs is deferred until later when a summary of the results is discussed.

Overhead Costs. -- Table 2.14 presents overhead costs for the system, and each division (elementary, middle, senior high). These costs are included in the analysis in order to put any cost differences which may arise under the other cost categories into proper perspective. All overhead costs were derived from a cost by location listing provided by the Department of Fiscal Planning, Management, and Control. From that listing, any costs assigned to either of the main offices (Independence Hill and Main Office) were included in system overhead. The only exceptions were costs that were specific to a particular division only. These costs were assigned to the corresponding division.

Transportation is one of the two largest cost items in system overhead, accounting for more than 27 percent of the total. Originally, it was intended that transportation costs be broken down by school so as to examine cost differences which may be due to calendar. However, there are many factors that vary over school attendance zones, for which we could not control, such as percentage of students who are bus riders, and topography

TABLE 2.14

OVERHEAD COSTS, SYSTEM AND DIVISION-WIDE, 1977-78

Fund Location	System Overhead ($)	Elementary Overhead ($)	Middle Overhead ($)	Senior High Overhead ($)
School Board offices	91,238.06			
Superintendent's offices	94,020.69			
Finance	241,171.29			
Administration-instructional supplies	164,020.54			
Purchasing	187,430.35			
Warehousing	195,159.72			
Safety & security	72,915.38			
Transportation	2,901,487.07			
Operations	532,665.94			
Classified personnel	48,427.26			
Data processing	240,839.56			
School plant services	76,934.24			
Maintenance	88,516.35			
Construction	132,818.31			
Instruction/assoc. supt.	54,869.80	435.04	2,505.82	3,207.28
Instruction personnel	107,489.14	26,283.00		26,283.00
Instruc. superintendent services/admin.	35,348.54			
ISS program & planning	185,990.06	378.96	1,980.00	960.00
Pupil personnel (guidance)	548,808.08			
Special education	1,792,648.04	1,475,608.92	516,528.35	308,838.84
Learning resources (library)	185,766.48			
Elementary education		176,497.41		
Middle education			73,673.86	
Secondary school				50,985.99
Summer school	95,079.07			
Adult education	84,950.41			
Art	55,184.59	189,088.76		
Foreign language	37,471.77			
Health & physical education	42,334.64	197,297.24		
Language arts & reading	46,036.49			
Mathematics	32,293.25			
Music	45,289.07	237,061.67		
Science	22,916.60			
Social studies	33,512.64			
Vocational education	122,076.87			
Title I	401,901.37			
Career education	37,732.60			
Pilot study, Title IVB, IVC, VIB	182,177.61			
Handicapped education	98,039.67			
Vocational education training grant	1,305.00			
Food service	192,191.65			
Textbooks (avg. past 3 years)	356,207.30			
Estimated fringe benefit overhead	266,535.50			
Fixed charges (insurance)	486,964.28			
Total	10,608,785.28	2,302,651.00	594,688.03	390,275.11
Per ADM (based on ADM of 36,096.92)	293.93	136.39	69.55	36.61
Capital cost (annualized)				
Facilities per ADM	8.41			
Equipment per ADM	9.48			
Total overhead per ADM	311.82			

and population density which affect both the number of riders and distance traveled. The disparity in ridership is particularly large. For example, of the two sample elementary schools, Sudley had no bus riders while about one-half of Minnieville's students were bused. Even if cost differences due to calendar could be shown to exist for one school, they might not appear for another because of the many uncontrollable variables. Therefore, our analysis is presented in the form of observations on possible additions or subtractions to transportation costs because of YRS.

Year-round schools may impose additions to transportation costs for the following reasons: First, uneven color groups may result in an inefficient use of bus capacity. Second, additional meandering of the routes may be required to pick up color groups at the middle and senior levels. Third, there exists a possibility of increased accidents should drivers rotate their routes. Fourth, there would be additional costs for any transportation provided to students during their intersessions (e.g., athletics). Taken together, these additions to cost will increase as the density of the area served by YRS decreases.

On the other hand, YRS may provide a reduction in transportation costs to the extent that a smaller standing fleet of buses is required. Since only three-fourths of the bused pupils need to be transported on any given day under YRS operation, the standing fleet could be reduced by as much as 25 percent from that size fleet necessary to accommodate the same ADM under a traditional operation. However, some of the possible reduction in fleet size may be translated into a greater cushion in the fleet in the form of more back-up buses and more buses for excursions.

The other of the two largest cost items in system overhead is special education. It accounts for 17 percent of system-wide overhead, and for 70 percent of division-wide overhead.

One last point concerns the assignment of the cost of the art, physical education, and music programs at the elementary level. These program costs were assigned to division overhead because of the fact that elementary art, physical education, and music teachers each serve several schools, traveling among them. Therefore, their costs cannot be allocated to any one school in particular and must be assigned as division overhead.

Summary Table Analysis. -- A per ADM cost comparison between YRS and traditional operation can be made by bringing together all of the cost assignments described above. The first comparison is presented in Table 2.15. This table shows each sample school's actual costs during 1977-78. It is a weak comparison at best because of the variance in capacity utilization across schools of the same level. For example, Minnieville and Graham Park YRS schools show higher costs than Sudley and Marsteller traditional schools, respectively, yet Minnieville and Graham Park only achieved 80 and 72 percent YRS capacity utilization while Sudley and Marsteller achieved 100 and 89 percent traditional capacity utilization, respectively. On the other hand, Woodbridge (YRS) showed significant savings over Stonewall Jackson (traditional), yet their capacity utilizations were 106 and 91 percent, respectively.

Table 2.16 highlights this capacity utilization problem further by presenting the costs of each school as it was in 1977-78 compared to a simulation of that school at 100 percent capacity utilization (columns A to C, and E to G). The four schools which were within about 10 percent of their capacity utilization show relatively mild cost adjustments in moving to capacity. However, the two schools which were far from YRS capacity utilization (Minnieville and Graham Park) show significant cost savings by expanding to YRS capacity.

TABLE 2.15

COST SUMMARY, 1977-78, PART I

	Traditional Schools				YRS Schools			
	(A) Traditional Based on Actual ADM	(B) YRS Simulated at Actual ADM x 1.33	(C) Traditional Simulated at Capacity ADM	(D) YRS Simulated at Capacity ADM x 1.33	(E) YRS Based on Actual ADM	(F) Traditional Simulated at Actual ADM x .75	(G) YRS Simulated at Capacity ADM x 1.33	(H) Traditional Simulated at Capacity ADM
	Sudley				**Minnieville**			
ADM	(715.53)				(761.02)			
Teacher costs	$ 574.32				$ 584.48			
Support staff	108.68				106.12			
Administration	59.90				60.98			
Substitutes	7.90				13.00			
Facilities (bldg.)	181.49				170.64			
Equipment	26.27				22.30			
Operations	46.79				55.00			
Maintenance	27.45				22.55			
Other instruct. costs	4.31				3.90			
Division overhead	136.39				136.39			
System overhead	311.82				311.82			
Total	$1,485.32				$1,487.18			
	Marsteller				**Graham Park**			
ADM	(837.34)				(856.43)			
Teacher costs	$ 865.42				$ 911.84			
Support staff	136.92				133.88			
Administration	53.72				54.88			
Substitutes	11.40				19.60			
Facilities (bldg.)	294.03				285.12			
Equipment	45.07				33.72			
Operations	69.58				85.38			
Maintenance	25.99				27.47			
Other instruct. costs	4.87				5.00			
Division overhead	69.55				69.55			
System overhead	311.82				311.82			
Total	$1,888.37				$1,938.26			
	Stonewall Jackson				**Woodbridge**			
ADM	(2,076.81)				(3,351.85)			
Teacher costs	$ 819.75				$ 806.88			
Support staff	141.26				103.05			
Administration	45.21				43.60			
Substitutes	10.50				17.30			
Facilities (bldg.)	384.40				256.06			
Equipment	13.16				8.17			
Operations	57.69				39.02			
Maintenance	85.99				76.57			
Other instruct. costs	27.22				17.13			
Division overhead	5.19				5.29			
System overhead	36.51				36.51			
Total	311.82				311.82			
	$1,938.70				$1,721.41			

TABLE 2.16
COST SUMMARY, 1977-78, PART II

	Traditional Schools				YRS Schools			
	(A) Traditional Based on Actual ADM	(B) YRS Simulated at Actual ADM x 1.33	(C) Traditional Simulated at Capacity ADM	(D) YRS Simulated at Capacity ADM x 1.33	(E) YRS Based on Actual ADM	(F) Traditional Simulated at Actual ADM x .75	(G) YRS Simulated at Capacity ADM x 1.33	(H) Traditional Simulated at Capacity ADM
	Sudley				**Minnieville**			
ADM	(715.53)		(715)		(761.02)		(946.64)	
Teacher costs	$ 574.32		$ 574.33		$ 584.48		$ 578.91	
Support staff	108.68		108.66		106.12		93.62	
Administration	59.90		59.94		60.98		49.02	
Substitutes	7.90		7.90		13.00		13.00	
Facilities (bldg.)	181.49		181.62		170.64		137.18	
Equipment	26.27		26.28		22.30		17.92	
Operations	46.79		46.83		55.00		46.38	
Maintenance	27.45		27.47		22.55		18.13	
Other instruct. costs	4.31		4.31		3.90		3.90	
Division overhead	136.39		136.39		136.39		136.39	
System overhead	311.82		311.82		311.82		311.82	
Total	$1,485.32		$1,485.55		$1,487.18		$1,406.27	
	Marstellar				**Graham Park**			
ADM	(837.34)		(945)		(856.43)		(1,186.64)	
Teacher costs	$ 865.42		$ 860.96		$ 911.84		$ 903.91	
Support staff	136.92		125.69		133.88		106.08	
Administration	53.72		47.60		54.88		58.54	
Substitutes	11.40		11.40		19.60		19.60	
Facilities (bldg.)	294.03		260.53		285.12		205.78	
Equipment	45.07		39.94		33.72		24.34	
Operations	69.58		62.92		85.38		64.71	
Maintenance	25.99		23.03		27.47		19.83	
Other instruct. costs	4.87		4.87		5.00		5.00	
Division overhead	69.55		69.55		69.55		69.55	
System overhead	311.82		311.82		311.82		311.82	
Total	$1,888.37		$1,818.31		$1,938.26		$1,789.16	
	Stonewall Jackson				**Woodbridge**			
ADM	(2,076.81)		(2,290)		(3,351.85)		(3,173.25)	
Teacher costs	$ 819.75		$ 816.37		$ 806.88		$ 811.22	
Support staff	141.26		132.32		103.05		106.43	
Administration	45.21		50.54		43.60		46.06	
Substitutes	10.50		10.50		17.30		17.30	
Facilities (bldg.)	384.40		348.62		256.06		270.47	
Equipment	13.16		11.94		8.17		8.63	
Operations	57.69		52.32		39.03		41.73	
Maintenance	85.99		79.01		76.57		80.26	
Other instruct. costs	27.22		24.69		17.13		18.10	
Division overhead	5.19		5.19		5.29		5.29	
System overhead	36.51		36.51		36.51		36.51	
Total	311.82		311.82		311.82		311.82	
	$1,938.70		$1,879.83		$1,721.41		$1,753.32	

75

76

Comparing the costs under each calendar of operation at 100 percent capacity utilization (C to G) now shows YRS to represent a savings at each level. Still, this comparison is not yet ideal since a comparison across schools is one between two different buildings, a factor that could not be controlled. A more ideal comparison is between each school's simulations of 100 percent capacity utilization under YRS and traditional operation. This comparison is presented in Table 2.17 (C to D and G to H) and is further elaborated in Table 2.18 which shows a breakdown of where the cost savings are under YRS. The factor cost where the largest savings occur is buildings. This is no surprise since the primary feature of YRS in terms of cost is to utilize capital more efficiently. For this reason also, there are significant savings for equipment, which is the other large capital expense. The second largest factor cost savings under YRS occurs in support staff. Year-round schools gain an advantage in support staff because many support staff positions are more dependent on the school building size and academic level than ADM. Maintenance costs also show consistent savings under YRS. This is primarily because of their assumed dependence on building size.

Administration costs showed savings under YRS at the elementary school level, a loss under YRS at the middle school level, and slight savings under YRS at the senior high school level. Obviously, administration costs can be quite variable. This variability in the figures can be explained by referring to the method of administration cost assignment. Most important is the fact that only whole administrators (as opposed to partial or part-time) were assigned. The reason that YRS shows a loss at the middle school level is that in going from the traditional to YRS simulation, ADM increased just enough to require an additional administrator.

TABLE 2.17

COST SUMMARY, 1977-78, PART III

	Traditional Schools				YRS Schools			
	(A) Traditional Based on Actual ADM	(B) YRS Simulated at Actual ADM x 1.33	(C) Traditional Simulated at Capacity ADM	(D) YRS Simulated at Capacity ADM x 1.33	(E) YRS Based on Actual ADM	(F) Traditional Simulated at Actual ADM x .75	(G) YRS Simulated at Capacity ADM x 1.33	(H) Traditional Simulated at Capacity ADM
			Sudley				**Minnieville**	
ADM			(715)	(953.31)			(946.64)	(710)
Teacher costs			$ 574.33	$ 584.14			$ 578.91	$ 569.11
Support staff			108.66	92.56			93.62	110.15
Administration			59.94	48.69			49.02	60.35
Substitutes			7.90	13.10			13.00	7.80
Facilities (bldg.)			181.62	136.22			137.18	182.90
Equipment			26.28	19.71			17.92	23.90
Operations			46.83	46.30			46.38	46.85
Maintenance			27.47	20.60			18.13	24.17
Other instruct. costs			4.31	4.31			3.90	3.90
Division overhead			136.39	136.39			136.39	136.39
System overhead			311.82	311.82			311.82	311.82
Total			$1,485.55	$1,413.84			$1,406.27	$1,477.36
			Marsteller				**Graham Park**	
ADM			(945)	(1,259.97)			(1,186.64)	(890)
Teacher costs			$ 860.96	$ 873.47			$ 903.91	$ 892.72
Support staff			125.69	101.85			106.08	131.05
Administration			47.60	55.12			58.54	50.54
Substitutes			11.40	18.90			19.60	11.80
Facilities (bldg.)			260.53	195.40			205.78	274.37
Equipment			39.94	29.95			24.34	32.45
Operations			62.92	62.03			64.71	65.63
Maintenance			23.03	17.27			19.83	26.43
Other instruct. costs			4.87	4.87			5.00	5.00
Division overhead			69.55	69.55			69.55	69.55
System overhead			311.82	311.82			311.82	311.82
Total			$1,818.31	$1,740.23			$1,789.16	$1,871.36
			Stonewall Jackson				**Woodbridge**	
ADM			(2,290)	(3,053.26)			(3,173.25)	(2,380)
Teacher costs			$ 816.37	$ 814.88			$ 811.22	$ 812.73
Support staff			132.32	111.33			106.43	128.03
Administration			50.54	47.86			46.06	48.63
Substitutes			10.50	17.40			17.30	10.40
Facilities (bldg.)			348.62	261.47			270.47	360.62
Equipment			11.94	8.95			8.63	11.51
Operations			52.32	39.24			41.73	54.97
Maintenance			79.01	78.19			80.26	81.03
Other instruct. costs			24.69	18.52			18.10	24.13
Division overhead			5.19	5.19			5.29	5.29
System overhead			36.51	36.51			36.51	36.51
Total			311.82	311.82			311.82	311.82
			$1,[illegible]3	[illegible]751[illegible]			[illegible]1,7[illegible]	[illegible]85.[illegible]

TABLE 2.18

COMPARISON OF COSTS PER ADM UNDER CAPACITY UTILIZATION FOR TRADITIONAL AND YEAR-ROUND OPERATION, 1977-78

School Factor Cost	Traditional Simulated at Capacity ADM ($)	YRS Simulated at Capacity ADM x 1.33 ($)	Absolute Savings of YRS ($)	Savings as % of Total Savings		Traditional Simulated at Capacity ADM ($)	YRS Simulated at Capacity ADM x 1.33 ($)	Absolute Savings of YRS ($)	Savings as % of Total Savings
Sudley					**Minnieville**				
Teacher costs	574.33	584.14	-9.81	-13.68		569.11	578.91	-9.80	-13.79
Support staff	108.66	92.56	16.10	22.45		110.15	93.62	16.53	23.26
Administration	59.94	48.69	11.25	15.69		60.35	49.02	11.33	15.94
Substitutes	7.90	13.10	-5.20	-7.25		7.80	13.00	-5.20	-7.32
Facilities (bldg.)	181.62	136.22	45.40	63.31		182.90	137.18	45.72	64.33
Equipment	26.28	19.71	6.57	9.16		23.90	17.92	5.98	8.41
Operations	46.83	46.30	.53	.74		46.85	46.38	.47	.66
Maintenance	27.47	20.60	6.87	9.58		24.17	18.13	6.04	8.50
Other instruct. cost	4.31	4.31				3.90	3.90		
Division overhead	136.39	136.39				136.39	136.39		
System overhead	311.82	311.82				311.82	311.82		
Total	1,485.55	1,413.84	71.71	100.00		1,477.34	1,406.27	71.07	100.00
% of total cost			(4.83%)					(4.81%)	
Marsteller					**Graham Park**				
Teacher costs	860.96	873.47	-12.51	-16.02		892.72	903.91	-11.19	-13.61
Support staff	125.69	101.85	23.84	30.53		131.05	106.08	24.97	30.38
Administration	47.60	55.12	-7.52	-9.63		50.54	58.54	-8.00	-9.73
Substitutes	11.40	18.90	-7.50	-9.60		11.80	19.60	-7.80	-9.49
Facilities (bldg.)	260.53	195.40	65.13	83.40		274.37	205.78	68.59	83.44
Equipment	39.94	29.95	9.99	12.79		32.45	24.34	8.11	9.87
Operations	62.92	62.03	.89	1.14		65.63	64.71	.92	1.12
Maintenance	23.03	17.27	5.76	7.38		26.43	19.83	6.60	8.03
Other instruct. cost	4.87	4.87				5.00	5.00		
Division overhead	69.55	69.55				69.55	69.55		
System overhead	311.82	311.82				311.82	311.82		
Total	1,818.31	1,740.23	78.09	100.00		1,871.36	1,789.16	82.20	100.00
% of total cost			(4.29%)					(4.39%)	
Stonewall Jackson					**Woodbridge**				
Teacher costs	816.37	814.88	1.49	1.16		812.73	811.22	1.51	1.14
Support staff	132.32	111.33	20.99	16.34		128.03	106.43	21.60	16.32
Administration	50.54	47.86	2.68	2.09		48.63	46.06	2.57	1.94
Substitutes	10.50	17.40	-6.90	-5.37		10.40	17.30	-6.90	-5.21
Facilities (bldg.)	348.62	261.47	87.15	67.84		360.62	270.47	90.15	68.11
Stadium	11.94	8.95	2.99	2.33		11.51	8.63	2.88	2.18
Equipment	52.32	39.24	13.08	10.18		54.97	41.23	13.74	10.38
Operations	79.01	78.19	.82	.64		81.03	80.26	.77	.58
Maintenance	24.69	18.52	6.17	4.80		24.13	18.10	6.03	4.56
Other instruct. cost	5.19	5.19				5.29	5.29		
Division overhead	36.51	36.51				36.51	36.51		
System overhead	311.82	311.82				311.82	311.82		
Total	1,879.83	1,751.36	128.47	100.00		1,885.67	1,753.32	132.35	100.00
% of total cost			(6.83%)					(7.02%)	

The YRS ADM had not increased enough though, to be sufficient to counterbalance the increased administration costs. Of course, this problem did not occur at the elementary school level or the senior high school level.

Substitutes costs showed a loss under YRS. This follows directly from our finding that the percentage leave days of total teacher days is typically higher under YRS. Teacher costs also showed a loss under YRS, at least over two of the three levels. The primary reason for this occurrance rests in the assignment of teacher aides. At each level of our sample schools, the actual (1977-78) assignment of teacher aides put more per ADM under YRS than under traditional operation. The consistency of this difference in teacher aide assignment implies that YRS somehow requires more teacher aides per ADM than traditional. However, we were unable to find any rationale for this implication. A secondary reason for teacher costs failing to show a saving under YRS is the limited use of extended contracts, especially at the middle and senior high school levels where one would expect them to be used extensively. Barely 50 percent of total teacher days at Graham Park and Woodbridge were filled by extended contracts, limiting any possible fringe benefits savings under YRS. However, it should be noted that with the recent increase in the maximum income to be subject to the F.I.C.A. tax, potential fringe benefit savings with extended contracts under YRS are substantially reduced.

If absolute savings under YRS are calculated as a percent of total cost, the senior high school level shows the most savings, about 7 percent. This reflects the greater importance of capital (building and equipment) at this level. For this reason also, we would expect to see the middle school level with the next largest savings. However, the apparent borderline circumstance for administration costs holds the middle school savings to 4 percent, slightly below the elementary savings of 5 percent.

Table 2.19 repeats the six columns already shown in the cost summary tables and adds two others (B and F). The two additional columns offer no improvement on the ideal comparisons of C and D or G and H, and are presented only to increase the range of our observations. Additional simulations are shown in Tables 2.20 and 2.21 and are discussed in the following paragraphs.

The simulation in Table 2.20 examines what the per ADM cost situation would have been if the three sample traditional schools had been run under YRS with their actual ADMs. Comparing these per ADM costs under YRS with their traditional counterparts (Column A, Table 2.19), shows that in every case the traditional calendar achieved savings over YRS. This is not too surprising in view of the first comparison made in Table 2.15. The reason for traditional showing savings over YRS is, again, the relative underutilization of capacity in the YRS simulations.

Table 2.21 shows the final set of simulations. Two simulations are conducted for each school at capacity ADM x 1.25 under a traditional calendar, and one simulation for each school at the same ADM under a YRS calendar. Two traditional simulations were necessary because of the assumption that additional space would be necessary to accommodate the increase in ADM above capacity under traditional operation. Providing additional space can be accomplished through numerous alternatives in the short-run,[1] however the analysis is intended to focus on long-run considerations. In the long-run, there are two viable alternatives to providing additional space -- case 1 being the expansion of the existing building, and case 2 being the construction of a new building (given that ADM exceeds capacity elsewhere so as

---

[1] See Chapter 4, page 5 for a detailed account of the alternatives.

TABLE 2.19

COST SUMMARY, 1977-78, PART IV

	Traditional Schools				YRS Schools			
	(A) Traditional Based on Actual ADM	(B) YRS Simulated at Actual ADM x 1.33	(C) Traditional Simulated at Capacity ADM	(D) YRS Simulated at Capacity ADM x 1.33	(E) YRS Based on Actual ADM	(F) Traditional Simulated at Actual ADM x .75	(G) YRS Simulated at Capacity ADM x 1.33	(H) Traditional Simulated at Capacity ADM
	Sudley				Minnieville			
ADM	(715.53)	(954.02)	(715)	(953.31)	(761.02)	(570.77)	(946.64)	(710)
Teacher costs	$ 574.32	$ 584.02	$ 574.33	$ 584.14	$ 584.48	$ 574.64	$ 578.91	$ 569.11
Support staff	108.68	92.56	108.66	92.56	106.12	125.75	93.62	110.15
Administration	59.90	48.65	59.94	48.69	60.98	75.08	49.02	60.35
Substitutes	7.90	13.10	7.90	13.10	13.00	7.80	13.00	7.80
Facilities (bldg.)	181.49	136.12	181.62	136.22	170.64	227.52	137.18	182.90
Equipment	26.27	19.70	26.28	19.71	22.30	29.73	17.92	23.90
Operations	46.79	46.28	46.83	46.30	55.00	55.57	46.38	46.85
Maintenance	27.45	20.59	27.47	20.60	22.55	30.07	18.13	24.17
Other instruct. costs	4.31	4.31	4.31	4.31	3.90	3.90	3.90	3.90
Division overhead	136.39	136.39	136.39	136.39	136.39	136.39	136.39	136.39
System overhead	311.82	311.82	311.82	311.82	311.82	311.82	311.82	311.82
Total	$1,485.32	$1,413.54	$1,485.55	$1,413.84	$1,487.18	$1,578.27	$1,406.27	$1,477.34
	Marsteller				Graham Park			
ADM	(837.34)	(1,116.43)	(945)	(1,259.97)	(856.43)	(642.32)	(1,186.64)	(890)
Teacher costs	$ 865.42	$ 876.19	$ 860.96	$ 873.47	$ 911.84	$ 902.41	$ 903.91	$ 892.72
Support staff	136.92	110.62	125.69	101.85	133.88	167.06	106.08	131.05
Administration	53.72	62.22	47.60	55.12	54.88	70.03	58.54	50.54
Substitutes	11.40	18.90	11.40	18.90	19.60	11.80	19.60	11.80
Facilities (bldg.)	294.03	220.52	260.53	195.40	285.12	380.16	205.78	274.37
Equipment	45.07	33.81	39.94	29.95	33.72	44.96	24.34	32.45
Operations	69.58	68.58	62.92	62.03	85.38	86.65	64.71	65.63
Maintenance	25.99	19.49	23.03	17.27	27.47	36.63	19.[illegible]	26.43
Other instruct. costs	4.87	4.87	4.87	4.87	5.00	5.00	5.00	5.00
Division overhead	69.55	69.55	69.55	69.55	69.55	69.55	69.55	69.55
System overhead	311.82	311.82	311.82	311.82	311.82	311.82	311.82	311.82
Total	$1,888.37	$1,796.57	$1,818.31	$1,740.23	$1,938.26	$2,086.07	$1,789.16	$1,871.36
	Stonewall Jackson				Woodbridge			
ADM	(2,076.81)	(2,769.01)	(2,290)	(3,053.26)	(3,351.85)	(2,513.89)	(3,173.25)	(2,380)
Teacher costs	$ 819.75	$ 817.35	$ 816.37	$ 814.88	$ 806.88	$ 811.18	$ 811.22	$ 812.73
Support staff	141.26	116.54	132.32	111.33	103.05	123.65	106.43	128.03
Administration	45.21	52.78	50.54	47.86	43.60	46.04	46.06	48.63
Substitutes	10.50	17.40	10.50	17.40	17.30	10.40	17.30	10.40
Facilities (bldg.)	384.40	288.31	348.62	261.47	256.06	341.41	270.47	360.62
Equipment	13.16	9.87	11.94	8.95	8.17	10.90	8.63	11.51
Operations	57.69	43.27	52.32	39.24	39.03	52.04	41.73	54.97
Maintenance	85.99	85.08	79.01	78.19	76.57	77.30	80.26	81.03
Other instruct. costs	27.22	20.42	24.69	18.52	17.13	22.84	18.10	24.13
Division overhead	5.19	5.19	5.19	5.19	5.29	5.29	5.29	5.29
System overhead	36.51	36.51	36.51	36.51	36.51	36.51	36.51	36.51
Total	311.82	311.82	311.82	311.82	311.82	311.82	311.82	311.82
	$1,938.70	$1,804.54	$1,879.83	$1,751.36	$1,721.41	$1,849.38	$1,753.32	$1,885.67

TABLE 2.20

YEAR-ROUND SCHOOL SIMULATIONS AT THE ACTUAL ADMs FOR TRADITIONAL SCHOOLS, 1977-78

	YRS Simulated at Actual ADM		
	(I) Sudley Elementary (ADM 715.53) ($)	(J) Marsteller Middle (ADM 837.34) ($)	(K) Stonewall Jackson Senior High (ADM 2,076.81) ($)
Teacher costs	590.57	883.57	826.72
Support staff	109.32	136.20	141.10
Administration	61.86	56.13	70.37
Substitutes	13.10	18.90	17.40
Facilities (bldg.)	181.49	294.03	384.40
Stadium			13.16
Equipment	26.27	45.07	57.69
Operations	58.01	87.75	109.74
Maintenance	27.45	25.99	27.22
Other instructional costs	4.31	4.87	5.19
Division overhead	136.39	69.55	36.51
System overhead	311.82	311.82	311.82
Total	1,520.39	1,933.88	2,001.32
Greater cost under YRS:			
Absolute difference	35.07	45.51	62.62
% difference	2.36	2.41	3.23

TABLE 2.21

SIMULATIONS AT CAPACITY ADM x 1.25

	Sudley Elementary School			Minnieville Elementary School		
	(L) Traditional Simulation Case 1 ($)	(M) Traditional Simulation Case 2 ($)	(N) YRS Simulation ($)	(O) Traditional Simulation Case 1 ($)	(P) Traditional Simulation Case 2 ($)	(Q) YRS Simulation ($)
	(ADM 893.75)			(ADM 887.5)		
Teacher cost	569.96	569.96	585.28	564.73	564.73	580.19
Support staff	104.16	108.66	95.95	105.57	110.15	97.08
Administration	47.95	59.94	51.93	48.28	60.35	52.29
Substitutes	7.90	7.90	13.11	7.82	7.80	12.98
Facilities	181.62	181.62	145.30	182.90	182.90	146.32
Stadium						
Equipment	26.28	26.28	21.03	23.90	23.90	19.12
Operations	46.83	46.83	48.66	46.85	46.85	48.74
Maintenance	21.97	27.47	21.97	19.34	24.17	19.34
Other instruct. costs	4.31	4.31	4.31	3.90	3.90	3.90
Division overhead	136.39	136.39	136.39	136.39	136.39	136.39
System overhead	311.82	311.82	311.82	311.82	311.82	311.82
Total	1,459.19	1,481.18	1,435.75	1,451.50	1,472.96	1,428.17

	Marsteller Middle School			Graham Park Middle School		
	(L) Traditional Simulation Case 1 ($)	(M) Traditional Simulation Case 2 ($)	(N) YRS Simulation ($)	(O) Traditional Simulation Case 1 ($)	(P) Traditional Simulation Case 2 ($)	(Q) YRS Simulation ($)
	(ADM 1,181.25)			(ADM 1,112.5)		
Teacher cost	857.48	857.48	874.84	888.15	888.15	905.46
Support staff	118.78	125.69	106.40	123.77	131.05	110.89
Administration	55.81	47.60	58.80	59.27	50.54	62.43
Substitutes	11.40	11.40	18.90	11.80	11.80	19.60
Facilities	260.53	260.53	208.42	274.37	274.37	219.49
Stadium						
Equipment	39.94	39.94	31.95	32.45	32.45	25.96
Operations	62.92	62.92	65.43	65.63	65.63	68.28
Maintenance	23.03	23.03	18.42	26.43	26.43	21.15
Other instruct. costs	4.87	4.87	4.87	5.00	5.00	5.00
Division overhead	69.55	69.55	69.55	69.55	69.55	69.55
System overhead	311.82	311.82	311.82	311.82	311.82	311.82
Total	1,816.13	1,814.83	1,769.40	1,868.24	1,866.79	1,819.63

TABLE 2.21 (continued)

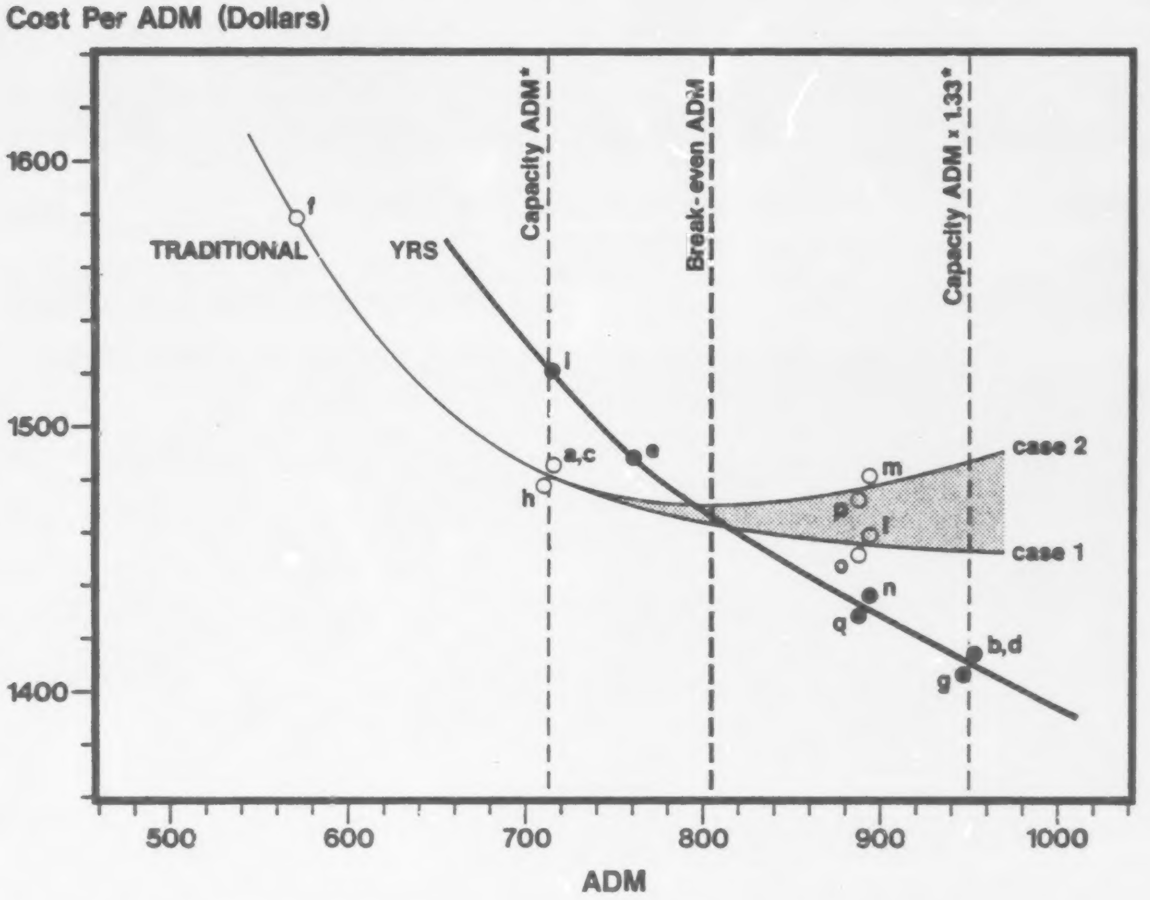
SIMULATIONS AT CAPACITY ADM x 1.25

	Stonewall Jackson Senior High School			Woodbridge Senior High School		
	(L) Traditional Simulation Case 1 ($)	(M) Traditional Simulation Case 2 ($)	(N) YRS Simulation ($)	(O) Traditional Simulation Case 1 ($)	(P) Traditional Simulation Case 2 ($)	(Q) YRS Simulation ($)
	(ADM 2,862.5)			(ADM 2,975)		
Teacher cost	810.41	810.41	816.50	806.75	806.75	812.90
Support staff	128.60	132.32	114.17	124.39	128.03	110.68
Administration	40.43	50.54	51.05	47.25	48.63	49.13
Substitutes	10.50	10.50	17.40	10.40	10.40	17.30
Facilities	348.62	348.62	278.89	360.62	360.62	288.49
Stadium	11.94	11.91	9.55	11.51	11.54	9.21
Equipment	52.32	52.32	41.85	54.97	54.97	43.97
Operations	79.01	79.01	82.66	81.03	81.03	84.87
Maintenance	24.69	24.69	19.75	24.13	24.13	19.30
Other instruct. costs	5.19	5.19	5.19	5.29	5.29	5.29
Division overhead	36.51	36.51	36.51	36.51	36.51	36.51
System overhead	311.82	311.82	311.82	311.82	311.82	311.82
Total	1,860.04	1,873.84	1,785.34	1,875.67	1,879.72	1,789.47

to warrant the need for an additional whole school). The only difference between the two cases in terms of cost arises from the ability of case 1 to spread some rather fixed costs (mostly administrative and secretarial) over the increased ADM, whereas case 2 would reflect the same per ADM costs in these fixed cost categories that existed at capacity ADM. Comparing these two cases in Table 2.21 (L and M, O and P) gives an idea of the magnitude of the differences involved. At the elementary school level, the difference is most severe, reflecting the relatively low pupil to administrative staff ratio at the elementary schools. At the middle school level, the expected trend actually reverses direction. The reason being that in case 1 there is just barely enough of an increase in ADM to require an additional administrator. The added cost of the additional administrator is just enough to wipe out the expected savings under case 1, bringing the two cases to about the same per ADM cost. At the senior high school level, we return to the expected trend showing a mild difference in favor of case 1.

Of the two cases, case 1 appears to be less costly, in general, than case 2. Thus the ability of a traditional operation to compete with a YRS operation on a cost basis is improved by the decision to expand buildings (case 1) in order to provide additional space. However, in reality the ability to employ either case 1 or 2 will depend on such factors as the limits placed on the expansion of an existing building, the availability of land, and the system-wide distribution of ADM and the number of ADM in excess of capacity. Case 2 must therefore remain as a possible alternative to be employed since it may on occasion represent the only alternative left.

Figure 2.2. Elementary School Cost Curves, 1977-78

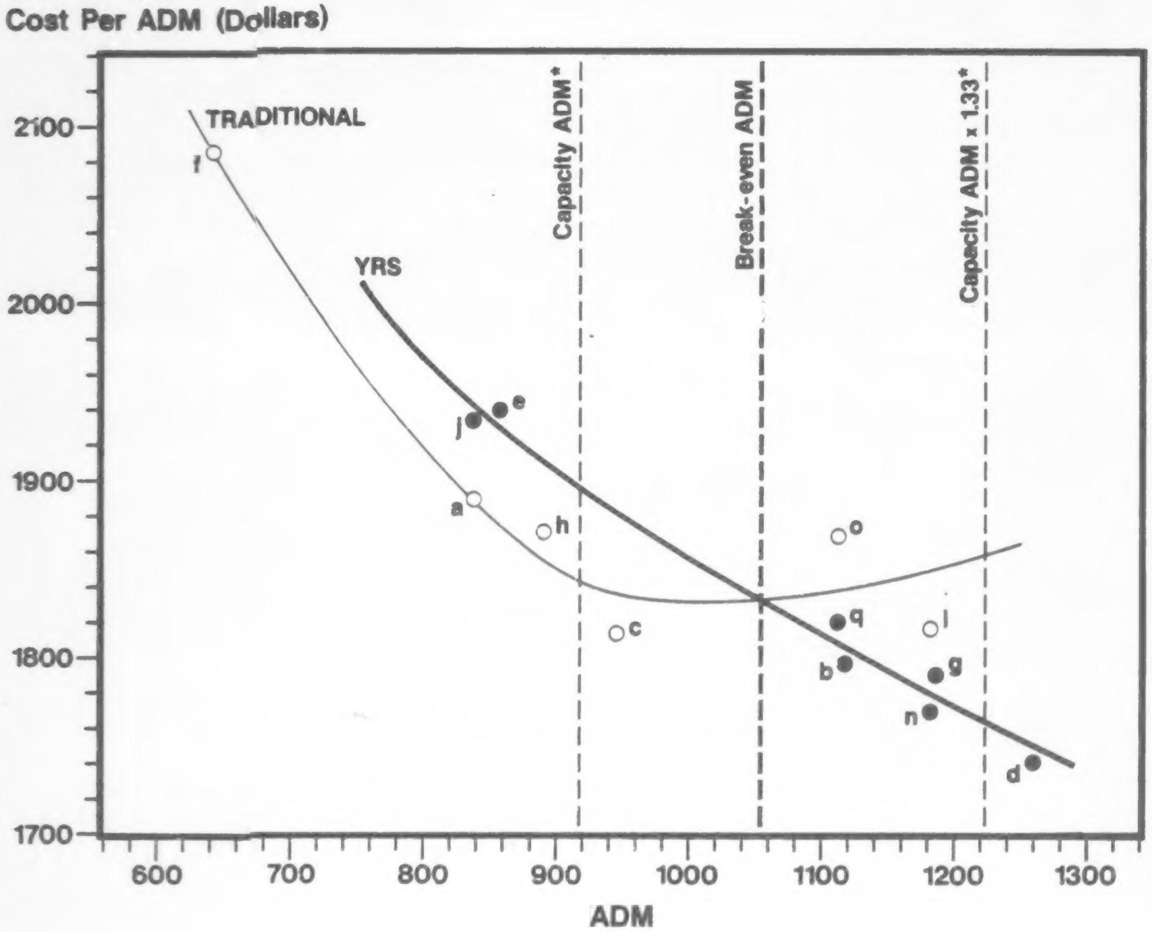


* Average of both schools.
Note: The letter assigned to each point corresponds to the column headings in tables 2.19, 2.20, and 2.21.

Graphic Analysis

The results presented in Tables 2.19, 2.20, and 2.21 are repeated in Figures 2.2, 2.3, and 2.4. Each point on the figures corresponds to one of the columns in the aforementioned tables. Thus, the plot for each simulation at each level can be found by reference through the letter assigned to each point. The collection of points corresponding to each calendar defines an approximate average cost curve for each calendar. The height of a curve at any given ADM can be interpreted as an average cost per ADM of operation under the calendar corresponding to that curve.

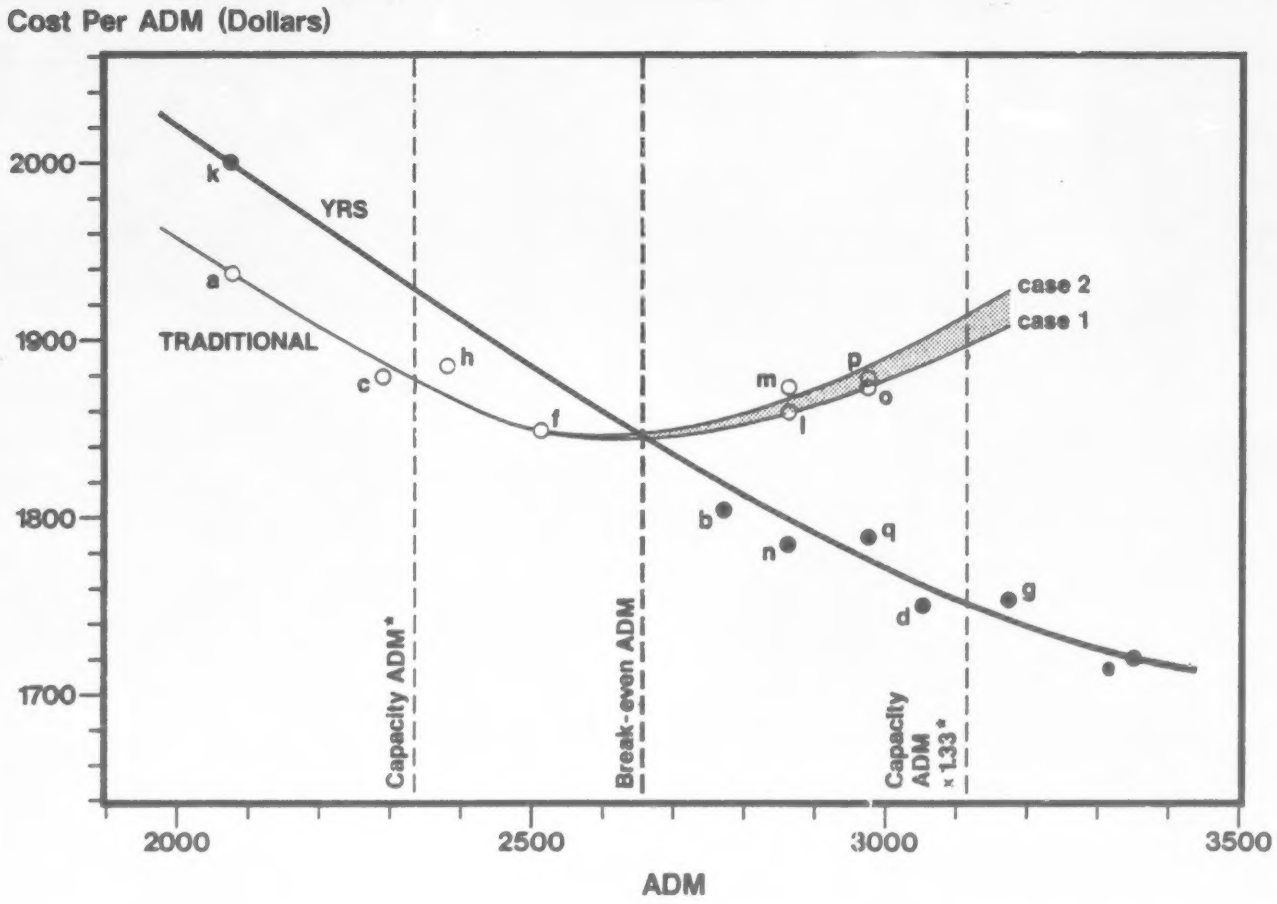
Figure 2.3. Middle School Cost Curves, 1977-78



* Average of both schools.
Note: The letter assigned to each point corresponds to the column headings in tables 2.19, 2.20, and 2.21.

The downward portion of each curve indicates the range over which the ADM may fluctuate within a given size building. Once the ADM in a building expands above the capacity ADM of that building, additional space must be provided, assuming overcrowding is not permitted. Of course for year-round schools, ADM must exceed capacity ADM x 1.33 before additional space is needed. As mentioned above, concerning Table 2.21, the additional space can be provided by two alternative methods, where case 1 is expansion of the existing building, and case 2 is the construction of a new building.

Figure 2.4. Senior High School Cost Curves, 1977-78



* Average of both schools.
Note: The letter assigned to each point corresponds to the column headings in tables 2.19, 2.20, and 2.21.

The distinction between these two cases is highlighted in the figures for the traditional cost curves only. Note that there were no apparent cost differences at the middle school level, so the traditional cost curve to the right of capacity ADM represents both case 1 and case 2. Consideration of additional space costs under YRS were irrelevent to the analysis.

The reason that the traditional cost curve turns up is therefore due to the need for additional space once capacity ADM is exceeded. In reality, ADMs substantially above capacity ADMs have been tolerated in the past. However, such situations may involve a deterioration in the quality of education or bring into doubt the designated capacity number.

Capacity is a flexible concept dependent upon such variables as program space per student and program assignments to rooms.

The two curves intersect defining a break-even ADM where the calendar of operation makes no difference in costs. The intersection takes place at about 13 percent above capacity ADM for the elementary schools, 15 percent above capacity ADM for middle schools, and 14 percent above capacity ADM for the senior high schools. Note that the intersection may vary plus or minus 2.5 percent for the elementary schools and plus or minus .4 percent for the senior high schools depending on the case 1, case 2 alternatives.

In summary, figures 2.2, 2.3, and 2.4 lead to the conclusion that the ADM attending a given school must exceed the capacity ADM of that school by a certain percentage before any savings under a YRS operation will materialize. That "certain percentage" is defined by the break-even ADM for each level. On the other hand, should the ADM attending a given school not exceed the break-even ADM of that school, a YRS operation at that school would more costly than a traditional operation.

The Brown Study

In December 1977, Richard V. Brown of the Prince William County Public Schools staff completed a report entitled, "A Study of the Management of Year-Round School Operation in Prince William County, Virginia." The purpose of the study was to make recommendations for changes needed to bring operation of YRS to an ideal level and to make cost estimates for such changes.

Brown's recommendations that would result in recurring costs and for which data were provided are treated in this section. Those recommendations that would result in one-time costs are covered in Chapter 3. All total cost figures are Brown's; the per ADM estimates were derived by dividing his totals by year-round school ADM in 1977-78.

Brown Recommendation Number 1: Uniform guidelines for educational facets impacting the community should be developed by a committee composed of key community representatives and appropriate instructional personnel, said guidelines to continually be communicated to the various publics.
Cost: Total $43,700; per ADM $1.87.

Comment: Since YRS has been in operation since 1971 we do not understand why such a large effort should be necessary each year. No basis for the cost estimate is given.

Brown Recommendation Number 4: Authorize the Assistant Superintendent for School Plant Services to include the necessary monies in his budget to accommodate the needs of year-round schools.
Cost: Total $191,000; per ADM $8.17.

Comment: On the basis of our analysis there do not appear to be major maintenance items unique to YRS. While we could not control for differences in maintenance quality between traditional and YRS, we found no difference in maintenance expenditures. More careful scheduling of maintenance is required, but this does not necessarily imply greater costs. No basis for the cost estimate is provided.

Brown Recommendation Number 5: Matriculation into a YRE[1/] program from a traditional program should be facilitated by intersessions, tutoring, etc.
Cost: Total $460,000; per ADM $19.68.

Comment: The reason for this proposal is unclear. It appears to apply only to students moving from a traditional calendar school to YRS. Since it is conceivable that some students from traditional schools may move to a YRS school in September when their assigned color group began the school year in July, some additional tutoring will be required. The amount of additional tutoring needed will also be a function of the difference in standards between the old and new school districts. This is not attributable to YRS. In addition, the

---

[1/] Brown used YRE (year-round education) as a synonym for YRS.

further into the school year the transfer is, the less additional tutoring because of YRS needed. Overall, the additional cost estimate of $460,000 for 46 teachers ($10,000 per teacher) seems very high.

Brown Recommendation Number 13: Mixed color calendar, combination grade classes should be avoided, except as required, e.g. performing band and singleton courses.[1]
Cost: Total $100,000 to $150,000; per ADM: $4.28 to $6.42.

Comment: If it can be determined that mixed color classes provide a reduced quality of education compared with traditional, then there is justification for charging such a cost to YRS. No basis for determining the estimate was provided.

Brown Recommendation Number 19: Transportation's budget should be increased (1) to enable shorter runs for special education students and (2) to provide transportation to school for students taking part in intersessions.
Cost: Total $37,800; per ADM $1.62.

Comment: In regard to (1), this cost seems to apply to traditional as well and should not be charged to YRS alone. In regard to (2), this does represent some expansion of program over traditional, since some students are given greater exposure to activities. However, others are not (e.g., band). Transportation of athletic team members is already a cost. The cost estimate apparently does not include bus acquisition cost.

From the foregoing analysis of the Brown recommendations it can be seen that if they are accepted then YRS savings, even under ideal circumstances, are reduced considerably. For example, the savings discussed in Table 2.18 would be reduced by about 2 percentage points. Moreover there were several other recommendations in the Brown report that would result in higher annual costs for which Brown did not provide estimates.

---

[1] Singleton courses are special advanced courses (e.g., French-5, aerospace, and advanced calculus) that have a limited number of students per class.

On the other hand, as noted in the comments, many of Brown's cost estimates were unsubstantiated and the basis for including some of the costs is open to question.

Snow Days

An interesting feature of YRS operation in Prince William County is that students in the traditional program have a schedule of 186 days of instruction including six snow days while those in the YRS program have 180 days with no snow days. Thus, if it does not snow, the traditional students receive six more days of instruction. Each snow day must be made up in the YRS program but not in the traditional program until the six snow days have been exhausted. Consequently, if all six days were used, both systems would have the same number of instruction days. If the traditional calendar students do not use all six of their snow days, then they receive more days of instruction. No additional compensation is provided to YRS teachers if snow days are necessary, but there are extra costs for classified personnel and bus drivers. Mr. Richard H. Chapin, Associate Superintendent for School Services, estimates those extra costs at $13,000 per snow day. This would amount to $0.56 per ADM. Because of the fact that this cost would depend on the number of snow days and is rather minor, we did not attempt to separate it as a special cost. Instead it is incorporated in support cost and system-wide overhead.

CHAPTER 3

START-UP COSTS

General Observations

Start-up conversion costs are those one-time costs which are incurred in changing the operation of a school from traditional operation to YRS. Lack of precise data made the isolation of start-up costs difficult. For example, while it was easy to determine the capital cost of air-conditioning Graham Park Middle School, it was difficult to ascertain the central office personnel cost incurred to plan, operate, and evaluate the YRS program. The start-up costs that we were able to develop for the sample schools are presented in Table 3.1. Notice that in Table 3.1 a distinction is made between historical costs and 1977-78 costs. Historical costs represent those start-up costs (in current dollars) which were actually incurred during the start-up of the three sample YRS schools. The 1977-78 costs represent start-up costs that would have been incurred had each of the sample schools been converted to YRS for the 1977-78 school year.

Paid-up contracts are a one-time payment made to teachers who are changing from a traditional school operation to a YRS operation within the system. Under traditional operation, the teachers are paid over a twelve month period, from September to August. In switching to YRS, the traditional pay would overlap the YRS pay for the first two months of the transition year. Prince William County School policy was to eliminate this overlap by distributing the last two months of traditional pay ahead of schedule before

TABLE 3.1

START-UP COSTS, HISTORICAL AND 1977-78

	Paid-Up Contracts			Air-Conditioning Cost		
	Total Current Dollars ($)	(A) Interest Cost ($)	(B) In-service Costs Total ($)	(C) Total ($)	Annualized ($)	All Start-up Costs ($) = (A)+(B)+(C)
Elementary						
Sudley						
1977-78	84,726.52	652.40	1,200.00			1,852.40
Minnieville						
Historical	21,999.20	169.39	7,800.00			7,969.39
1977-78	67,586.35	520.42	965.20			1,485.62
Middle						
Marsteller						
1977-78	122,798.77	945.55	2,020.00	589,623.22	43,101.91	592,588.77
Graham Park						
Historical	88,045.64	677.95	2,640.00	589,623.22	43,101.91	592,941.17
1977-78	94,198.94	725.33	1,619.60			2,344.93
Senior High						
Stonewall Jackson						
1977-78	287,262.68	2,211.92	4,320.00			6,531.92
Woodbridge						
Historical	308,546.75	2,375.81	9,300.00			11,675.81
1977-76	347,731.47	2,677.53	5,216.40			7,893.93

the YRS year began in July. The real cost incurred by the school system from this policy is the interest foregone by distributing funds ahead of schedule. This interest cost is presented in Table 3.1 and was calculated based on 4.62 percent per annum, the average rate of return received by Prince William County during 1977-78.

In-service costs represent learning costs of the faculty involved in the transition to YRS. Typically, faculty members are awarded leave days in order to travel and observe other YRS operations or for general training in YRS curricula. The leave days must be covered by substitute teachers, the cost of which is charged to in-service costs. The in-service costs in Table 3.1 represent budget appropriations and may therefore be an overstatement of true in-service costs. This information was provided by Dr. David Lepard, Supervisor of Staff Development and Training for Prince William County Schools. Dr. Lepard pointed out that many of the budgeted in-service days may not be used. In addition, he also observed that the school system has gained sufficient experience with YRS to reduce necessary learning costs. This fact is currently being incorporated into policy as the number of in-service days permitted per faculty member has been reduced over the years. In Table 3.1 this reduction in budgeted in-service costs over the years can be measured by comparing historical costs with 1977-78 costs.

Another potential start-up cost is air-conditioning installation costs. As can be seen from Table 3.1, Graham Park Middle School had to be refitted for air conditioning when it was converted to YRS. Marsteller Middle School also would require installation of air conditioning if it were converted to YRS. No air-conditioning start-up costs are charged to the other schools because they were already air-conditioned. This underlines the fact that air-conditioning equipment is not unique to YRS. In fact, according to Mr. John P. Hamill, Supervisor of School Buildings, Virginia Department of Education, no school building constructed in Virginia during the last two or three years has been without air conditioning.[1/]

Interest costs and in-service costs are both operations costs in nature and therefore would be incurred in the year of transition from traditional to YRS. Air-conditioning installation costs are capital costs by nature and therefore should be annualized over their expected life, which is equal to the expected life of the building. It is not inconceivable, however, that the entire capital cost would be absorbed in the first year of transition, especially in view of its small size relative to other capital costs and the budget.

If only the operations costs components of total start-up costs are examined, the per ADM cost during the one year in which these costs are incurred would amount to less than $3. In the cases where annualized capital costs are incurred, the per ADM cost in the first year might be as high as $9, dropping to $6 per year afterwards. In either case, the impact of start-up costs on the total cost per ADM is relatively insignificant.

The Brown Study

In addition to his recommendations involving annual operating costs, Brown also mentioned some one-time costs which are of the start-up type. As before, the per ADM estimates were derived by dividing his totals by year-round school ADM in 1977-78

[1/] Interview, September 20, 1978

Brown Recommendation Number 3: One time only, budget for fourteen months to enable the necessary two month stockpile of personnel [sic], services, materials, and equipment.
Cost: Total $106,700; per ADM $4.56.

Comment: Although no reason is given for this recommendation, it may refer to the desire to make large purchases at the same time traditional schools are in the market. There is some feeling that price concessions are more likely at that time. On the other hand, since under YRS the number of pupils in school per day is less than or equal to the number under a traditional calendar, it might be possible to manage with lower stockpiles. No basis for the cost estimate is provided.

Brown Recommendation Number 9: Adequate storage space should be provided for teachers' instructional materials when these teachers are tracked and move from one instructional area to another instructional area.
Cost: $100,000; per ADM $4.28.

Comment: The rationale for the recommendation seems plausible, particularly at the elementary level. No basis for the cost estimate is provided.

Brown's recommendations, if accepted, add about $9 to the $3 per ADM cost (exclusive of air conditioning) already mentioned. A one-time cost of $12 per ADM is very low, especially if it is annualized. Although we did not annualize any start-up costs other than air conditioning, a good case can be made for doing so if it is assumed that the YRS program will be retained over a number of years.

CHAPTER 4

COMPARISON WITH OTHER STUDIES

Broad Comparisons

There have been a few cost studies of 45-15 YRS programs. In this chapter, we compare our results with those for a similar study the Tayloe Murphy Institute (TMI) conducted for Loudoun County, Virginia[1/] and with those of the earlier Turnkey study of Prince William County[2/] and a Stanford Research Institute (SRI) study of Pajaro, California.[3/] Two other school systems that have been examined are not included because of major deficiencies in the study methodologies.[4/] Aside from the obvious fact that the four studies cover three different school systems and that all cover different time periods, they also differ in regard to grade levels examined and the utilization of capacity by the subject schools. Furthermore, the researchers used different methodologies and assumptions. Thus, any comparison of study results must be tempered by a careful examination of differences in subject characteristics and study techniques.

1/ John L. Knapp, Stephen W. Morris, and John S. Wright, 45-15 Costs, a Cost Study of Loudoun County's 45-15 Program (Charlottesville: Tayloe Murphy Institute, 1976).

2/ Curry and Sweeney, 45-15 and the Cost of Education.

3/ Robert Burnett, Stephen Kutner, and Sol Pelavin, A Cost Analysis of a Year-Round School Evaluation (and Comparison to a Traditional Calendar School) (Menlo Park, California: Stanford Research Institute, March 24, 1977, Discussion Draft).

4/ For a discussion of YRS 45-15 cost studies for the Valley View District, Romeoville, Illinois and for Virginia Beach, Virginia see Knapp, Morris, and Wright, 45-15 Costs, pp. 5-10.

Table 4.1 compares some of the major characteristics of this study with those of the three other studies.

All of the studies covered events in the 1970s, with the earliest 1971-72 and the most recent, 1977-78.

The present TMI study of Prince William County is the only one covering the senior high level. Level of school is an important consideration since building costs per capacity ADM are higher for the upper grades and the opportunities for utilization of extended contract teachers are also greater for the upper grades.

Because of the important role of school building utilization in the economic justification for YRS, the bond period and interest rate assumptions are crucial. Generally, YRS gains in any comparison with traditional programs as the bond period is shortened and the interest rate is raised. Such changes increase annual principal and interest payments which, when summed, are the measure of annual building costs used by these studies. Since YRS is intended to spread fixed building costs over a larger number of students, any assumption that increases building costs reflects favorably on YRS. The Turnkey study used a 20 year bond period but amortized principal and interest over the useful lifetime of the building which was assumed to be 50 years. This procedure resulted in a downward bias for building costs. The TMI Loudoun study used two bond periods, 20 and 30 years, showing alternate results under each assumption. The SRI study used a 20 year maturity. All four students used interest rates in the 5 percent to 6 percent range.

The SRI study was limited to costs incurred at the school level. It did not include district-wide overhead for administrative personnel, transportation, and other costs not incurred directly by each school.

TABLE 4.1

MAJOR FEATURES OF SELECTED YEAR-ROUND SCHOOL COST STUDIES

	Prince William (TMI)	Prince William (Turnkey)	Loudoun (TMI)	Pajaro (SRI)
Study period	1977-78	1971-72	1973-74 1974-75	1975-76
Grade level and number ( ) of schools studied	elem. (2) middle (2) senior (2)	elem. (3) middle (1)	elem. (3) middle (1)	elem. (2)
Bond period for annualized building costs and interest rate ( )	25 (5.3%)	20[a] (5.5%)	20 (6%) 30 (6%)	20 (6%)
Includes all costs	yes	yes	yes	no
Ratio of actual ADM to capacity in YRS schools	elem. 1.072 middle 0.962 senior 1.408	elem. 1.333[b] mid. 1.333[b]	73-74 elem. 1.157; 1.220; 1.501 mid. 1.323 74-75 elem. 1.072; 1.196; 1.307 mid. 1.358	elem. 1.158
Basic methodology	simulation, cross-sectional	simulation	simulation, cross-sectional	simulation, cross-sectiona

---

a/ Principal and interest were amortized over the useful life of the building, which was assumed to be 50 years.

b/ Implicit assumption.

The other studies prorated these costs. Thus, when savings were computed as a percentage of total costs per student, the base was lower in the SRI study than in the others.

The Turnkey study did not use the actual ADM in the schools it studied. In the case of Godwin Middle School, the Turnkey study assumed that Godwin would accommodate a YRS ADM of 1,400. To serve an equivalent ADM under traditional operation, the study simulated a one-third expansion of the building size. In contrast, the other studies used actual data. As shown in Table 4.1, there was a large variation in the capital utilization ratio [the ratio of actual ADM to (traditional) capacity ADM] in the YRS schools. The TMI Prince William study exhibited a range of 0.962 (Graham Park Middle School) to 1.408 (Woodbridge Senior High School), indicating that at one extreme a YRS school was operating below traditional capacity and at the other extreme another YRS school was operating above YRS capacity (capacity ADM x 1.33). The TMI Loudoun County study encompassed two years and between the years capacity was added to each of the YRS schools. In the first year the capital utilization ratio ranged from 1.157 to 1.501; in the second year the range was from 1.072 to 1.358. The SRI study covered one elementary YRS school with a capital utilization ratio of 1.158. This school served an area with a large number of children from migrant worker families and a highly mobile population. These factors combined to cause large month-to-month variations in enrollment, and therefore, the ADM did not represent a stable average.

All of the studies used simulations. The Turnkey Prince William study assumed the YRS school was operating the capacity ADM x 1.33 and then simulated costs for the same ADM under traditional operation. The TMI

Loudoun study used actual ADM at the YRS schools to compute costs and then compared those results with a simulated traditional school needed to handle the same ADM. The Loudoun study also compared costs of YRS schools at actual ADM with costs of traditional schools at actual ADM. The SRI study followed procedures similar to those of the Loudoun study. The TMI Prince William study shows costs for YRS schools based on actual ADM and compares them with costs under a variety of simulations including the types used in the above-mentioned studies.

The per pupil percentage savings or extra costs reported by the various studies are shown in Table 4.2. For this comparison, only the TMI Prince William results for the three sample YRS schools are used, and the figures reflect the difference in costs for the schools operated under YRS at actual ADM and simulated under traditional operation at the same ADM. To accomplish this it was necessary to simulate an expansion in building size of 7 percent for Minnieville Elementary School and 41 percent for Woodbridge Senior High School. Since Graham Park Middle School has an actual ADM below capacity, no enlargement was required for that school. Based on this simulation, the elementary and middle YRS modes show extra costs, and the senior high YRS mode shows very large savings. The senior high school outcome is a result of Woodbridge exceeding capacity ADM x 1.33 and the very large increase in building size required for the traditional simulation.

Results from the four studies show cost savings for elementary schools ranging from -1.1 percent to 9.1 percent. At the middle school level the savings ranged from -3.3 percent to 9.6 percent. The present study, which showed a 12.1 percent saving for Woodbridge Senior High School, contained the only observation for that level.

TABLE 4.2

SAVINGS PER PUPIL OF YEAR-ROUND VERSUS TRADITIONAL OPERATION ACCORDING TO SELECTED STUDIES

	Percent Savings per Pupil
TMI, Prince William [a]	
Minnieville Elementary	-1.1
Graham Park Middle	-3.3
Woodbridge Senior	12.1
Turnkey, Prince William	
Godwin Middle	9.6
Neabsco Elementary Dale City Elementary Bel Air Elementary	5.3
TMI, Loudoun [b]	
Guilford Elementary	2.9; 2.2 [b]
Sterling Elementary	4.5; 4.4 [b]
Sully Elementary	9.1; 7.0 [b]
Sterling Middle	7.7; 9.0 [b]
SRI, Pajaro	
Freedom Elementary	0.4 [c]

---

[a] Percent savings or extra costs were estimated from Figures 2.2, 2.3, and 2.4. Where applicable an average of case 1 and case 2 was used.

[b] 20-year bond maturity assumption. 1973-74 and 1974-75 savings are shown in sequence for each school.

[c] Based on school-specific costs. If overhead were added, the savings would have been about 0.3 percent.

A key variable influencing study outcomes was the capital utilization ratio. Generally, the higher the ratio, the greater the savings. This is displayed graphically in Figure 4.1.[1/]

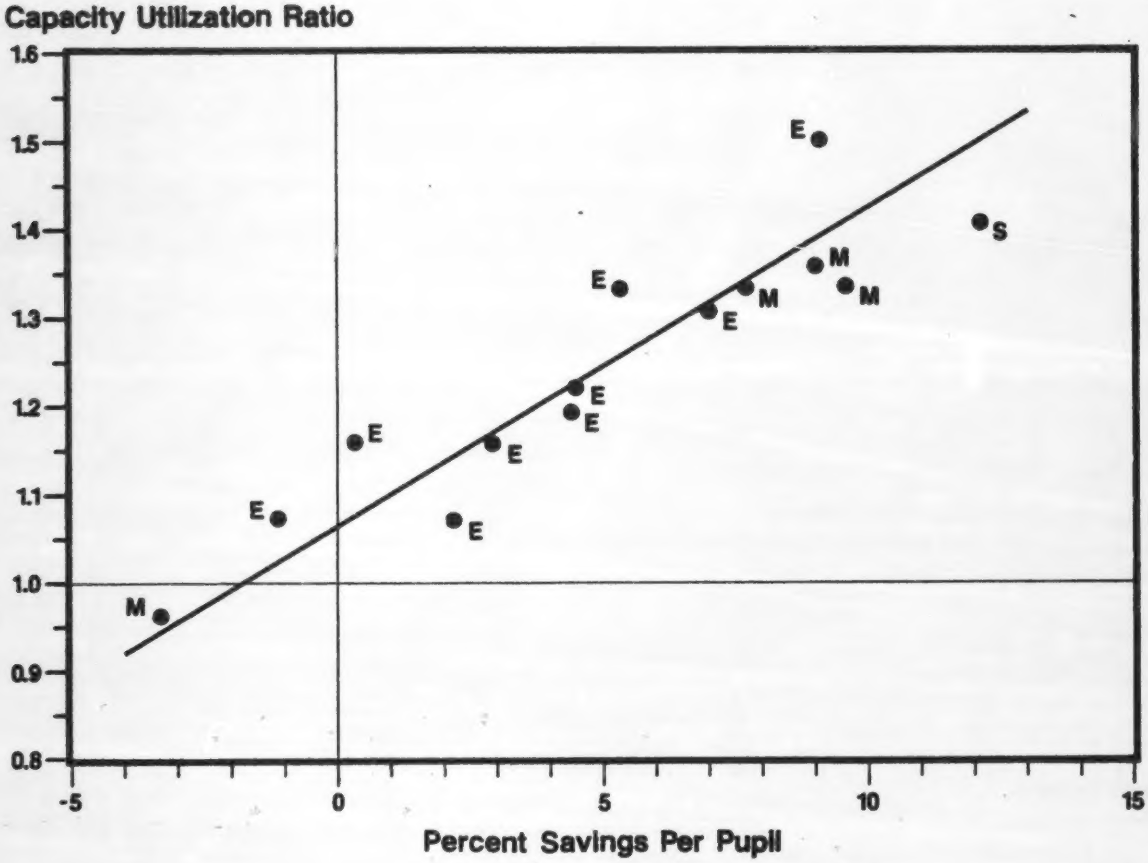
Detailed Comparison with Turnkey Study

Because the Turnkey study also covered Prince William County Schools it is of particular interest to compare its results with those of the present study. As previously mentioned, Turnkey did its detailed work for Godwin Middle School. The figures which were developed were based on Godwin operating at an ADM equal to capacity ADM x 1.33 under YRS and traditional calendars. To accommodate the same ADM under both modes it was necessary to simulate a building one-third larger for traditional operation. Conceptually, there are two ways to accomplish such a simulation. To illustrate, assume three schools each with a capacity ADM of 300 and a total capacity of 900. Under YRS each school would have a capacity ADM x 1.33 of 400 for a total of 1,200. To provide space for the same total ADM under traditional operation it would be necessary to either (1) increase the size of each building by one-third or (2) build another school with capacity of 300. This is illustrated below:

		Traditional Expanded	
Traditional at Capacity ADM	YRS at Capacity ADM x 1.33	(Case 1) At Capacity ADM with 1/3 Increase in Bldg.	(Case 2) At Capacity ADM with a New Bldg.
300	400	400	300
300	400	400	300
300	400	400	300
			300
900	1,200	1,200	1,200

[1/] The trend line in Figure 4.1 was plotted from the equation: percentage savings = -29.26 + 27.549 (capacity utilization ratio). The t statistic (8.344) is in parentheses. R^2 = .8404 significant at the .01 level.

Figure 4.1. Savings of Year-round Schools in Relation to Capacity Utilization



E = Elementary schools, M = Middle schools, S = Senior high schools

Which case is used affects the results of the simulation since case 2 provides the most favorable outcome for YRS. Because school systems expand capacity in both ways, there is no unambiguous answer as to which case to use. However, it is likely that more of a system's classroom expansion will occur through the building of new schools than from additions. Thus, case 2 is more common.

Case 2 was the basis for the logic employed in the Turnkey simulation even though the end result was shown as an expansion of building. Although our study did not develop data for a comparison of the type used by

Turnkey, a similar comparison is provided by examining the results of YRS simulated at capacity ADM x 1.33 with traditional simulated at capacity ADM for Graham Park Middle School (YRS). Although the simulations use different ADMs, each is based on full utilization of capacity and gives a result as if a traditional new school were built to handle the extra ADM possible under YRS.

Table 4.3 compares results of the two studies. Our study shows YRS savings of 4.4 percent. This result is slightly under one-half of the relative cost saving found by Turnkey (9.6 percent).

Turnkey found savings for teachers. In contrast, we found extra costs under YRS. There are two principal reasons for this difference. (1) Turnkey assumed all YRS teachers would be on extended contracts and that this would result in savings because of the absence of in-service days in the extended contracts. As already noted, we made no adjustment for in-service days savings under YRS due to the apparent variation among schools and programs and the fact that a large percentage of YRS teachers were not on extended contracts. (2) Turnkey did not develop separate data on substitute costs. Our results showed higher substitute costs under YRS.

Unlike Turnkey, we found extra costs for administration. This result was due to the assignment of an extra assistant principal under YRS operation.

Both studies show savings under the remaining categories, but their relative importance varies. The Turnkey study showed much lower relative savings on facilities. The primary reason for this outcome was the 50 year period used by Turnkey to spread building costs.

Turnkey utility operations costs were based on the assumption that it costs twice as much to heat as to cool, whereas we assumed equality. Our support staff savings were based on actual staffing patterns in contrast to the more theoretical computations of Turnkey.

TABLE 4.3

COMPARISON OF SAVINGS OR EXTRA COSTS PER PUPIL OF YEAR-ROUND VERSUS TRADITIONAL OPERATION ACCORDING TO TMI AND TURNKEY PRINCE WILLIAM STUDIES

	Savings or (Extra Costs) under YRS			
	TMI, Graham Park (1977-78)		Turnkey, Godwin (1971-72)	
	Amount ($)	Percent of Total	Amount ($)	Percent of Total
Teachers	(18.99)[a]	(23.1)	40.66[b]	37.1
Administration	(8.00)	(9.7)	9.19	8.4
Facilities (bldg.)	68.59	83.4	24.39	22.3
Operations and support staff	25.89	31.5	29.22	26.7
Equipment	8.11	9.9	4.18	3.8
Maintenance	6.60	8.0	1.82	1.7
	82.20	100.0	109.46	100.0
Exhibit:				
Total trad. cost	$1,871.36	$1,143.06		
Percent saving of YRS	4.4%	9.6%		

---

a/ Includes aides, librarians, counselors, coaching supplement, substitutes.
b/ Includes aides, librarians, and counselors.

Equipment and maintenance savings were both more significant in our study. Turnkey assumed different life spans for various types of equipment in contrast to our standard nine years. In regard to maintenance, Turnkey used a more sophisticated concept of measurement, but one we were unable to follow due to the lack of sufficient supporting information.

In conclusion, there were many differences in the procedures used by the two studies. The Turnkey study was based on a higher level of abstraction than our study which utilized, as much as possible, actual practices in Prince William County. In addition to methodological differences, there were many other disimilarities. In particular, the studies covered different buildings, and the studies occurred at different points in time. While Turnkey examined a brand-new program, we worked with one that had been in existence for six years.

CHAPTER 5

STUDY IMPLICATIONS

If YRS capacity (capacity ADM x 1.33) is fully utilized and there is careful management, a YRS school has lower costs than a traditional school. The magnitude of savings depends on school level (elementary, middle, or senior high) and management policies and practices.

If YRS capacity is not fully utilized, then at a certain level of operation (the break-even ADM) the costs per student will be the same under the two modes. At ADMs below the break-even level YRS becomes more costly. This is illustrated graphically in Figure 5.1. There are savings when actual ADM equals YRS capacity (capacity ADM x 1.33). If actual ADM is lower, there continue to be savings, but by reduced amounts, until the break-even ADM is reached. Below the break-even level, traditional operation is cheaper.

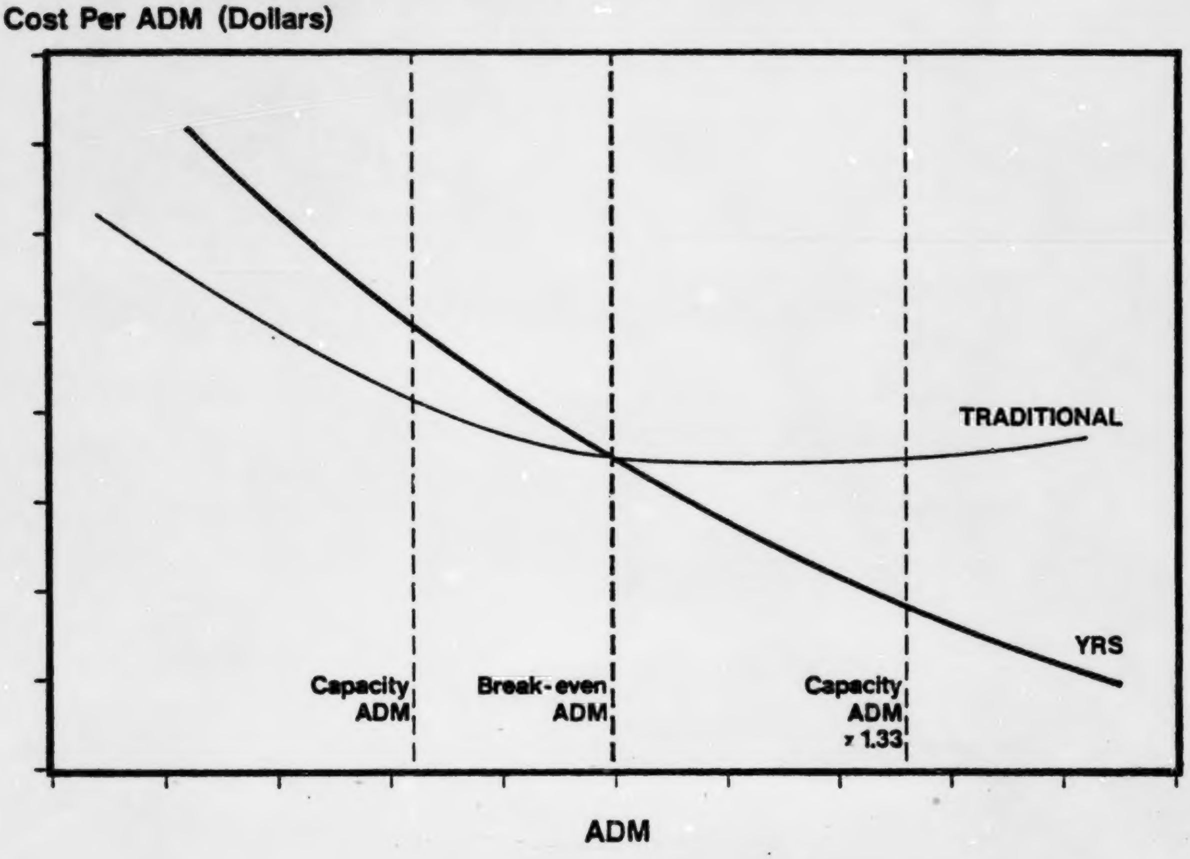
The break-even ADM can be expressed in ratio form. The break-even ratio is the ratio of break-even ADM to traditional capacity ADM. Thus, if the break-even ADM of a school were 690 and its traditional capacity were 600 then the break-even ratio would be $\frac{690}{600} = 1.15$.

Based on our study of six sample schools in Prince William County we developed break-even ratios by school level:

Elementary	1.13
Middle	1.15
Senior	1.14

In the remainder of this analysis, for the purpose of simplicity,

Figure 5.1. Typical Cost Curves



we treat these ratios as if they were precise figures. In reality, the break-even ratios are inexact and should be considered as averages rather than as precise measures. The reasons for their inexactness are: (1) they can vary according to the type of simulations used; (2) savings or extra costs are minor close to the break-even ratio; and (3) the ratios are based on a limited sample. Despite these qualifications, we feel that the above measures of break-even ratios are accurate enough to support the remainder of the analysis in this chapter.

TABLE 5.1

ELEMENTARY SCHOOL CAPACITY UTILIZATION, 1977-78

School	Actual ADM	Capacity Utilization Based On: Current Calendar Operation: Capacity Under Current Calendar	Current Calendar Operation: Capacity Excess or (Shortage)	Current Calendar Operation: Actual ADM as % of Capacity	YRS, All Schools: Capacity of YRS (Capacity ADM x 1.33)	YRS, All Schools: Capacity Excess or (Shortage)	YRS, All Schools: ADM as % of Capacity	Traditional, All Schools: Capacity of Traditional (Capacity ADM)	Traditional, All Schools: Capacity Excess or (Shortage)	Traditional, All Schools: ADM as % of Capacity
Traditional										
Sudley	715.53	715	(.53)	100.07	953.31	237.78	75.06	715	(.53)	100.07
Gainesville a/	480.55	465	(15.55)	103.34	619.98	139.43	77.51	465	(15.55)	103.34
Nokesville	475.69	470	(5.69)	101.21	626.65	150.96	75.91	470	(5.69)	101.21
Yorkshire	417.33	445	27.67	93.78	593.32	175.99	70.34	445	27.67	93.78
Loch Lomond	443.83	455	11.17	97.55	606.65	162.82	73.16	455	11.17	97.55
Westgate	599.59	615	15.41	97.49	819.98	220.39	73.12	615	15.41	97.49
Sinclair	560.04	595	34.96	94.12	793.31	233.27	70.60	595	34.96	94.12
Tyler	478.52	575	96.48	83.22	766.65	288.13	62.42	575	96.48	83.22
Bennett	379.21	625	245.79	60.67	833.31	454.10	45.51	625	245.79	60.67
Coles	490.86	425	(65.86)	115.50	566.65	75.79	86.62	425	(65.86)	115.50
Parkside	440.43	390	(50.43)	112.93	519.99	79.[illegible]	84.70	390	(50.43)	112.93
Subtotal, Trad.	5,481.58	5,775	293.42	94.92	7,699.80	2,218.22	71.19	5,775	293.42	94.92
YRS										
Minnieville	761.02	946.64	185.62	80.39	946.64	185.62	80.39	710	(41.02)	107.19
Rockledge	820.61	773.31	(47.30)	106.12	773.31	(47.30)	106.12	580	(240.61)	141.48
Kerrydale	831.41	773.31	(58.10)	107.51	773.31	(51.10)	107.51	580	(251.41)	143.35
Occoquan	466.75	719.98	253.23	64.83	719.98	253.23	64.83	540	73.25	86.40
Dumfries	609.24	619.98	10.74	98.27	619.98	10.74	98.27	465	(144.24)	131.02
Saunders b/	945.34	1,133.31	187.97	83.41	1,133.31	187.97	83.41	850	(95.34)	111.22
Washington-Reid b/	352.56	246.66	(105.90)	142.93	246.66	(105.90)	142.93	185	(167.56)	190.57
Triangle	583.08	559.99	(23.09)	104.12	559.99	(23.09)	104.12	420	(163.08)	138.83
Kilby	436.68	726.65	289.97	60.09	726.65	289.97	60.09	545	108.32	80.12
Featherstone	395.04	619.98	224.94	63.72	619.98	224.94	63.72	465	69.96	84.95
Potomac View	653.76	866.65	212.89	75.44	866.65	212.89	75.44	650	(3.76)	100.58
Marumsco Hills	592.29	859.98	267.69	68.87	859.98	267.69	68.87	645	52.71	91.83
Elizabeth Vaughan	544.09	686.65	142.56	79.24	686.65	142.56	79.24	515	(29.09)	105.65
Belmont	368.20	686.65	318.43	53.62	686.65	318.45	53.62	515	146.80	71.50
Dale City	691.89	719.98	28.09	96.10	719.98	28.09	96.10	540	(151.89)	128.13
Bel Air	732.65	686.65	(46.00)	106.70	686.65	(46.00)	106.70	515	(217.65)	142.26
Neabsco	949.39	1,166.64	217.25	81.38	1,166.64	217.25	81.38	875	(74.39)	108.50
Rippon	365.05	533.32	177.27	66.76	533.32	177.27	66.76	400	43.95	89.01
Subtotal, YRS	11,090.05	13,326.33	2,236.28	83.22	13,326.33	2,236.28	83.22	9,995	(1,085.05)	110.96
Total, all schools	16,571.63	19,101.33	2,529.70	86.76	21,026.13	4,454.50	78.81	15,770	(791.63)	101.08

---

a/ Gainesville figures include those for Antioch McCrae which houses grades K-1 for Gainesville.

b/ These two schools have been closed for the 1978-79 year and replaced by Pattie (capacity 690 ADM) and Enterprise (capacity 705 ADM). These changes result in a net increase of traditional capacity of 360 ADM and of YRS capacity of 480 ADM. The capacities of Saunders and Washington-Reid are old figures as shown; the school administration did not revise its 1975 capacity rating for these schools because they had closed.

TABLE 5.2

MIDDLE AND SENIOR HIGH SCHOOL CAPACITY UTILIZATION, 1977-78

		Capacity Utilization Based On:								
		Current Calendar Operation			YRS, All Schools			Traditional, All Schools		
School	Actual ADM	Capacity Under Current Calendar	Capacity Excess or (Shortage)	Actual ADM as % of Capacity	Capacity of YRS (Capacity ADM x 1.33)	Capacity Excess or (Shortage)	ADM as % of Capacity	Capacity of Traditional (Capacity ADM)	Capacity Excess or Shortage)	ADM as % of Capacity
Middle Schools										
Traditional										
Parkside	812.04	970	157.96	83.72	1,293.30	481.26	62.79	970	157.96	83.72
Brentsville	388.00	360	(28.00)	107.78	479.99	91.99	80.84	360	(28.00)	107.78
Marsteller	837.34	945	107.66	88.61	1,259.97	422.63	66.46	945	107.66	88.61
Stonewall Jackson	1,142.26	1,100	(42.26)	103.84	1,466.63	324.37	77.88	1,100	(42.26)	103.84
Subtotal, Trad.	3,179.64	3,375	195.36	94.21	4,499.89	1,320.25	70.66	3,375	195.36	94.21
YRS										
Graham Park	856.43	1,186.64	330.21	72.17	1,186.64	330.21	72.17	890	33.57	96.23
Lynn	1,163.69	1,559.96	396.27	74.60	1,559.96	395.27	74.60	1,170	6.31	99.46
Rippon	1,070.19	1,466.63	396.44	72.97	1,466.63	396.44	72.97	1,100	29.81	97.29
Woodbridge	1,454.65	1,666.63	211.98	87.28	1,666.63	211.98	87.28	1,250	(204.65)	116.37
Godwin	1,213.98	1,519.96	305.98	79.87	1,519.96	305.98	79.87	1,140	(73.98)	106.49
Subtotal, YRS	5,758.94	7,399.82	1,640.88	77.83	7,399.82	1,640.88	77.83	5,550	(208.94)	103.76
Total, all schools	8,938.58	10,774.82	1,836.24	82.96	11,899.71	2,961.13	75.12	8,925	(13.58)	100.15
Senior High Schools										
Traditional										
Stonewall Jackson	2,076.81	2,290	213.19	90.69	3,053.26	976.45	68.02	2,290	213.19	90.69
Brentsville	530.00	610	80.00	86.89	813.31	283.31	65.17	610	80.00	86.89
Osbourn Park	1,085.01	2,280	1,194.99	47.59	3,039.92	1,954.91	35.69	2,280	1,194.99	47.59
Subtotal, Trad.	3,691.82	5,180	1,488.18	71.27	6,906.49	3,214.67	53.45	5,180	1,488.18	71.27
YRS										
Woodbridge	3,351.85	3,173.25	(178.60)	105.63	3,173.25	(178.60)	105.63	2,380	(971.85)	140.83
Gar-Field	3,187.77	3,079.92	(107.85)	103.50	3,079.92	(107.85)	103.50	2,310	(877.77)	138.00
Subtotal, YRS	6,539.62	6,253.17	(286.45)	104.58	6,253.17	(286.45)	104.58	3,690	(1,849.62)	139.44
Total, all schools	10,231.44	11,433.17	1,201.73	89.49	13,519.66	2,928.22	77.75	9,870	(361.44)	103.66

Tables 5.1 and 5.2 show the capacity utilization of all the schools in 1977-78. In the tables, the column farthest to the right shows the ratio of each school's 1977-78 ADM to (traditional) capacity. These ratios correspond directly with the break-even ratios. The remainder of each table will be discussed later.

Of the eighteen YRS elementary schools in 1977-78, only seven exceeded the 1.13 break-even ratio for elementary schools. Furthermore, one of the seven, Washington-Reid, has since been closed and its replacement will not exceed the ratio.1/ The YRS elementary school in our sample (Minnieville) was below the break-even ratio since its capacity utilization ratio [actual ADM divided by (traditional) capacity] was only 1.07.

Of the five YRS middle schools, only Woodbridge Middle School with a capital utilization ratio of 1.16, was very close to the break-even ratio; the other schools were substantially below it. Our sample YRS school, Graham Park, had a capital utilization ratio of only .96.

In contrast to the general underutilization of capacity at the elementary and middle YRS schools, both YRS senior high schools operated well above the break-even ratio of 1.14. Our sample YRS school, Woodbridge Senior High School, had a capacity utilization ratio of 1.41.

1/ In 1977-78 the actual capacity utilization ratios for Saunders and Washington-Reid were 1.11 and 1.91, respectively. The replacement schools, Pattie and Enterprise will have a combined capacity of 1,395 ADM. If the combined actual 1977-78 of the two closed schools (1,297.9 ADM) is divided by the combined capacity of the two new schools, the combined capacity utilization ratio is .93.

In summary, we find that of the 11,090.05 ADM in YRS elementary schools, 6,883.17 or 62 percent is in schools operating below the break-even ratio.[1] At the middle school level, which has 5,758.94 ADM in YRS schools, 4,304.25 or 75 percent is in schools below the break-even ratio. For the two YRS senior high schools, none is below the break-even ratio. If all YRS school levels are combined, we find that of the total ADM (23,388.61) the number in schools below the break-even ratio is 11,187.42 (48 percent).

The findings of the study in regard to the crucial role of capacity utilization were echoed by other studies. The California Joint Legislative Audit Committee examined YRS in several school districts and concluded:

> unless YRS schedules alleviate overcrowding and/or avoid capital investments in new facilities, the use of YRS will slightly increase the cost of education. Ten of the 11 school districts we analyzed did not use YRS primarily to increase student capacity and, as a result, YRS contributed to a slightly higher cost per ADA in fiscal year 1975-76.[2]

The Tayloe Murphy Institute study of four YRS schools in Loudoun County also emphasized the importance of capacity utilization.[3] In that study, the relative YRS savings were a function of capacity utilization.

Perhaps, the most interesting observation is that the original cost study of YRS in Prince William County which was conducted by Education Turnkey Systems, Inc. emphasized that the savings it showed were dependent on full utilization of YRS capacity (capacity ADM x 1.33):

1/ For this computation, Pattie and Enterprise were assumed to be operating below the break-even ratio.

2/ Joint Legislative Audit Committee, Fiscal Impact of California's Year-Round School Programs, p. 1. Note, ADA is average daily membership. .

3/ Knapp, Morris, and Wright, 45-15 Costs, pp. 43-45.

> The long-run equilibrium aspects of the analysis assume that the district does not have facilities in excess of that necessary to service the selected student enrollment. In reality, this excess or slack in facilities will exist immediately after implementation of the year-round program. The degree to which this slack continues to be present depends upon the growth rate of the district and the speed with which the plan is implemented. In any event, it is most important that this facility slack not be allowed to pervade the philosophy of the school system. If the system becomes accustomed to using slack in an inefficient manner, the projected capital savings will never materialize. In order to assess the full economic potential of 45-15 the analysis will consider that the district has divested itself of excess facilities.[1]

Prince William County Schools commissioned the present cost study of YRS schools in order to provide a factual basis for decisions regarding the future of YRS in the county. Although our contractual commitment did not call for an analysis of the problems now facing the county, we feel that the results of this study provide the basis for some preliminary observations. Obviously, a more thorough analysis by the school administration should be undertaken before any final decisions are made.

It appears that over the next five years Prince William County Schools face a stable or slightly declining enrollment. Current plans call for the construction of Potomac Senior High School with opening in early 1980. Its capacity would be 1,500 ADM under traditional operation and 2,000 ADM under YRS operation. The county faces three basic options: (1) continuation of the existing mixed calendar system with roughly two-thirds of total enrollment in YRS; (2) conversion of all schools to YRS operation; (3) conversion of all schools to traditional operation.

Tables 5.1 and 5.2 show the capacity utilization that would have occurred in 1977-78 under the three different options. Notice that the capacity under the YRS options has been adjusted to capacity ADM x 1.33.

---

[1] Curry and Sweeney, 45-15 and the Cost of Education, p. 8.

Any analysis of capacity utilization entails two major qualifications. The first is that the figures presented in Tables 5.1 and 5.2 are for 1977-78 only. A more ideal analysis would take into consideration the expected future trends in ADM, both in the short-run and long-run. The second is that any comparison of ADM to capacity made on an aggregated basis, such as over the system as a whole, implicitly assumes that attendance zones are perfectly flexible so that each school's ADM can be adjusted to capacity. Achievement of this perfect flexibility in attendance zones would not come without a real cost in both transportation and inconvenience to some individuals. This added cost would have to be weighed against the benefits or savings which the perfect flexibility in attendance zones would permit.

Option 1--Status Quo

Under this option, the status quo, the county is operating many YRS schools below their break-even ADMs. This means that their costs are higher than they would be under a traditional calendar. Some savings could be achieved if some of the YRS schools were closed. The savings would be even larger if the buildings could be sold for something approaching their replacement value. However, given the specialized purpose of school buildings and the usual reluctance of the public sector to sell buildings, it is unlikely the buildings would be sold. The operation below capacity occurs at the elementary and middle school levels. This is not the case at the YRS high schools which are, in fact, presently operating in excess of capacity ADM x 1.33. The completion of Potomac Senior High School will end overcrowding and provide so much additional capacity ADM x 1.33 that the YRS senior high schools will also be operating below their break-even ADMs. Under the status quo the county school administration is faced with the demanding task of running two systems. Although our cost data are not sufficiently refined to provide proof, we assume that such a dual system is more costly to run in terms of extra manpower or in terms of the opportunity costs imposed by diverting management activities from other productive functions.

Option 2--All YRS

Under this option the remaining one-third of the student population which is located in western Prince William would be converted to YRS. There are presently ninteen traditonal schools. Only two, both of them elementary schools, are operating at or above their break-even ratios. Coles Elementary School has a capacity utilization ratio of 1.16 and Parkside has a ratio of 1.13. At the middle school level, the closest school to its break-even ratio is Stonewall Jackson Middle School (1.10), and at the senior high school level, the school closest is Stonewall Jackson Senior High School (.91).

The only way to operate these schools under YRS at a saving would be to close several of them. Ideally, the closed buildings should be sold for a price close to their replacement value. As mentioned in the discussion of option 1, this would be a difficult feat.

If all of the traditional school buildings were kept open twelve would require the installation of complete air-conditioning systems. In addition, Stonewall Jackson Middle School has only one wing air-conditioned so it would require installation of air-conditioning equipment in its two other wings.

There would be some one-time expense for paid-up contracts of the 40 percent of the teachers that are now paid over the twelve month period from September through August. This would represent an additional cash flow in the year of conversion. As shown in Chapter 3, the true cost would be the foregone interest on the accelerated payment.

Under complete YRS operation there would be some reduction in the required bus fleet. The savings would show up in terms of a smaller number of replacement vehicles in future years. This, of course, assumes that the reduced bus requirements would not be used as a greater cushion in the bus fleet.

A possible offset to lower capital costs for buses would be a rise in operating costs due to serving four color groups in the less densely populated western part of the county. If the bus routes had to be lengthened there would be higher operating costs due to the increased mileage.

Option 3--All Traditional

Under this option, the twenty-five schools now operating under YRS would be changed to a traditional calendar. Six YRS elementary schools are now operating significantly over traditional capacity (greater than 10 percentage points).[1] Together these schools exceed capacity ADM by 1,169. However, there are two vacant elementary schools, Saunders and Washington-Reid, with a combined traditional capacity ADM of 1,035 that could be reopened after some renovation and changes in attendance zones. Among the YRS middle schools, only Woodbridge is operating significantly over traditional capacity (16 percent). At the senior high school level both YRS schools exceed traditional capacity by a large margin, but this will not be the case after Potomac Senior High School is opened in 1980. Thus, there would be a need for some increase in traditional capacity at the middle school level if the system went all traditional. There is also a possibility that some increase would be required at the elementary level. There are seven ways in which this might be achieved:

---

[1] This count excludes Washington-Reid which has been closed.

(1) Use schools beyond their capacity. To some extent, overcrowding could be tolerated. Capacity is a rather loose concept and it is not unusual to operate schools beyond capacity. In cases where overcrowding is not excessive, this option is worth considering, particularly if the overcrowding is expected to exist for a relatively short time span.

(2) Make additions to existing school buildings. A common way to add capacity is to make additions to existing buildings. Such a procedure has two advantages over constructing new schools. First, it may be cheaper since classroom expansion may not require additional non-classroom space (e.g., stadium, kitchen, library). Second, if only a 25 percent increase in capacity is required, this can be accomplished by the expansion of an existing structure rather than by adding another building with a larger and unneeded capacity.

(3) Construct new buildings.

(4) Change attendance zones. While there is overutilization of traditional capacity in some schools, underutilization exists in others. A change in attendance zones, provided bus distances would not be excessive, might provide the required capacity without construction of new classrooms.

(5) Change grade levels. Presently, Prince William County uses the grade levels K-5; 6-8; 9-12. It is possible that a restructuring to K-6; 7-9; 10-12 would provide some capacity where required.

(6) Portable classrooms. This would be an inexpensive way to provide capacity if the extra demand is expected to be short-lived or if

an interim solution is desired while permanent construction is in progress.

(7) Split-shifts. As a short-run option, split shifts, whereby a school's capacity is doubled, could be used.

Another consideration is that a switch to traditional operation would not have to be made in one year. It could be phased-in over several years which would be the reverse of the procedure employed in the adoption of YRS.

There would be a cash flow windfall as the pay period of YRS teachers was switched to a September-August period. Currently, 60 percent of the teachers are in the YRS program.[1] However, since this switch would cause personal budgeting hardships for the teaching staff the county might wish to mitigate its effects through a gradual phase-in. Another pay consideration is that 46 percent of teachers now on extended contracts[2] would have to adjust to lower annual incomes. As a result, there might be pressure for offsetting raises in 194 day contract salaries.

There are many YRS schools that presently have abundant space because they are operated below capacity ADM x 1.33. If these schools were switched to traditional calendar operation some or all of this excess capacity would disappear. Thus, to the extent that surplus space had been used for other purposes such as reading resource centers, learning centers, etc. that space would no longer be available.

1/ The total number of teachers (excluding psychologists and visiting teachers) in October 1978 was 1,921. Of this total, 1,154 were in year-round schools.

2/ 535.5 of the YRS teachers are on extended contracts.

Capital Costs--Long-Run Versus Short-Run

Most of the analysis in this report has been of a long-run type, which is appropriate for planning over a time horizon of five or more years. Under long-run analysis it is proper to value all capital at replacement cost and to annualize it in the way we did.

On a short-run basis, where one is only looking a few years ahead, cash flow is an important consideration. In the preceding discussion some attention was given to cash flow for paid-up contracts and buses, but nothing was said concerning buildings and equipment. Existing buildings and equipment represent sunk costs that are unaffected by present utilization. For example, if the debt service (interest and bond retirement) on a building were $250,000 annually, that cost would be the same if the building were used at 75 percent or 100 percent of capacity. The only way absolute savings could be realized would be through sale of the capital asset and that would be difficult to achieve, particularly if one hoped to obtain a sale price close to the value of the structure as a school building.

As mentioned in option 3, it might be necessary to construct some additional capacity at the elementary and middle school levels. Potomac Senior High School is already planned, so that would not be an extra cost. If additional capacity were required. the building and equipment cost would be in the neighborhood of $3,500 per ADM at capacity. The annual cash flow for debt service would be about $260 per ADM at capacity.

APPENDIX TABLES

TABLE A.1

COLORGROUP BREAKDOWN EFFICIENCY

	ADM				
School	Red	Blue	Green	Orange	Total
Elementary feeding Woodbridge					
Saunders	225.98	240.01	201.46	277.89	945.34
Elizabeth Vaughn	142.68	142.42	91.85	167.14	544.09
Kerrydale	188.46	213.17	203.67	226.11	831.41
Minnieville	193.58	200.79	185.43	181.22	761.02
Marumsco Hills	184.32	134.60	145.19	128.18	592.29
Kilby	107.12	106.99	107.19	115.38	436.68
Belmont	80.23	112.71	91.48	83.78	368.20
Occoquan	131.40	118.10	107.81	109.44	466.75
Rockledge	202.07	181.14	193.93	243.46	820.60
Total elementary	1,455.84	1,449.93	1,328.01	1,532.60	5,766.38
Middle feeding Woodbridge					
Woodbridge	348.78	367.31	382.87	355.69	1,454.65
Lynn	287.78	293.21	259.43	323.21	1,163.63
Total middle	636.56	660.52	642.30	678.90	2,618.28
Woodbridge High	844.78	823.32	900.98	782.77	3.351.85
Total all levels	2,937.18	2,933.77	2,871.29	2,994.27	11,736.51
Elementary feeding Gar-Field					
Washington-Reid	36.31	137.03	77.95	101.27	352.56
Neabsco	180.48	230.19	275.72	263.00	949.39
Bel-Air	193.23	211.74	177.15	150.53	732.65
Dale City	161.24	156.73	127.42	246.50	691.89
Rippon	82.86	92.23	96.81	84.15	356.05
Dumfries	171.84	153.17	123.66	160.57	609.24
Triangle	120.69	144.48	123.51	194.40	583.08
Featherstone	89.23	96.69	88.73	120.39	395.04
Potomac View	165.66	165.77	163.09	159.24	653.76
Total elementary	1,201.54	1,388.03	1,254.04	1,480.05	5,323.66
Middle feeding Gar-Field					
Graham Park	206.80	250.88	163.53	235.22	856.43
Godwin	315.36	305.35	305.62	287.65	1,213.98
Rippon	262.36	264.14	306.66	237.03	1,070.19
Total middle	784.52	820.37	775.81	759.90	3,140.60
Gar-Field High	828.55	791.42	706.31	861.52	3,187.80
Total all levels	2,814.61	2,999.82	2,736.16	3,101.47	11,652.06

TABLE A.2

PERCENTAGE DISTRIBUTION OF ADM BY COLOR GROUP

	Percent of Total ADM							
	(A) Red	(B) Blue	(C) Green	(D) Orange	(E) Total	(F) Sum of Largest 3 Colors[a]	(G) Remaining Color	(H) Percentage Increase from YRS [(G÷F) x 100]
Elementary feeding Woodbridge								
Saunders	23.9	25.4	21.3	29.4	100.0	78.7	21.3	27.1
Elizabeth Vaughn	26.2	26.2	16.9	30.7	100.0	83.1	16.9	20.3
Kerrydale	22.7	25.6	24.5	27.3	100.0	77.3	22.7	29.4
Minnieville	25.4	26.4	24.4	23.8	100.0	76.2	23.8	31.2
Marumsco Hills	31.1	22.7	24.5	21.6	100.0	78.3	21.6	27.6
Kilby	24.5	24.5	24.5	26.4	100.0	75.4	24.5	32.5
Belmont	21.8	30.6	24.8	22.8	100.0	78.2	21.8	27.9
Occoquan	28.2	25.3	23.1	23.4	100.0	76.9	23.1	30.0
Rockledge	24.6	22.1	23.6	29.7	100.0	77.9	22.1	28.4
Total elementary	25.2	25.1	23.0	26.6	100.0	76.9	23.0	29.9
Middle feeding Woodbridge								
Woodbridge	24.0	25.3	26.3	24.5	100.0	76.1	24.0	31.5
Lynn	24.7	25.2	22.3	27.8	100.0	77.7	22.3	28.7
Total middle	24.3	25.2	24.5	25.9	100.0	75.6	24.3	32.1
Woodbridge High	25.2	24.6	26.9	23.4	100.0	76.7	23.4	30.5
Total all levels	25.0	25.0	24.5	25.5	100.0	75.5	24.5	32.5
Elementary feeding Gar-Field								
Washington-Reid	10.3	38.9	22.1	28.7	100.0	89.7	10.3	11.5
Neabsco	19.0	24,2	29.0	27.7	100.0	80.9	19.0	23.5
Bel-Air	26.4	28.9	24.2	20.5	100.0	79.5	20.5	25.8
Dale City	23.3	22.7	18.4	35.6	100.0	81.6	18.4	22.5
Rippon	23.3	25.9	27.2	23.6	100.0	76.7	23.3	30.4
Dumfries	28.2	25.1	20.3	26.4	100.0	79.7	20.3	25.5
Triangle	20.7	24.8	21.2	33.3	100.0	79.3	20.7	26.1
Featherstone	22.6	24.5	22.5	30.5	100.0	77.6	22.5	29.0
Potomac View	25.3	25.4	24.9	24.4	100.0	75.6	24.4	32.3
Total elementary	22.6	26.1	23.6	27.8	100.0	77.0	23.0	29.9
Middle feeding Gar-Field								
Graham Park	24.1	29.3	19.1	27.5	100.0	80.9	19.1	23.6
Godwin	26.0	25.2	25.2	23.7	100.0	76.4	23.7	31.0
Rippon	24.5	24.7	28.7	22.1	100.0	77.9	22.1	28.4
Total middle	25.0	26.1	24.7	24.2	100.0	75.8	24.2	31.9
Gar-Field High	26.0	24.8	22.2	27.0	100.0	77.8	22.2	28.5
Total all levels	24.2	25.7	23.5	26.6	100.0	76.4	23.7	31.0

TABLE A.3

STANDARDIZED EMPLOYEE COSTS FOR MINNIEVILLE ELEMENTARY (YRS) SCHOOL, 1977-78

Employees	No.	Days Employed X	Per Diem Rate ($) =	Annual Salary ($)	F.I.C.A. ($)	Life Ins. $7.20/$1,000/yr. ($)	Blue Cross $368.40/yr. ($)	Total Per Position ($)	Total Cost ($)
I. **Administrative staff**									
Principal	1	250		23,665	1,018.06	170.35	368.40	25,221.81	25,221.81
Asst. principal	1	250		19,661	1,018.06	141.55	368.40	21,189.01	21,189.01
II. **Teachers**									
Teachers	25	194	69.67	13,515.98	804.20	97.20	368.40	14,785.78	369,644.50
Kindergarten	2	230	62.11	14,285.30	849.92	102.92	368.40	15,606.44	31,212.88
Librarian	1	230	73.38	16,877.40	993.17	121.54	368.40	18,360.51	18,360.51
Kindergarten aide	3	230	32.32	7,433.60	442.30	53.50	368.40	8,297.80	24,893.40
III. **Support staff**									
Office secretary	2	236	34.86	8,226.96	489.50	59.26	368.40	9,144.12	18,288.24
Library secretary	1	236	34.50	8,142.00	484.45	58.61	368.40	9,144.12	9,053.46
Head custodian B	1	260		10,971.11	652.78	78.98	368.40	12,071.27	12,071.27
Custodians	2	260		7,693.66	457.77	55.37	368.40	8,575.20	17,150.40
Cafe. manager II 7hr./day	1	240	4.65/hr.	7,812.00	464.81	56.23	368.40	8,701.44	8,701.44
Cafe. workers 4.5hr./day	2	240	3.13/hr.	3,380.40	201.13		184.20	3,765.73	7,531.46
Cafe. workers 3hr./day	2	240	3.13/hr.	2,253.60	134.09			2,387.69	4,775.38
Cafe. aide 2hr./day	1	240	3.04/hr.	1,459.00	86.81			1,545.81	1,545.81

TABLE A.4

STANDARDIZED EMPLOYEE COSTS FOR MARSTELLER MIDDLE (TRADITIONAL) SCHOOL, 1977-78

Employees	No.	Days Employed x	Per Diem Rate ($) =	Annual Salary ($)	F.I.C.A. ($)	Life Ins. $7.20/$1,000/yr. ($)	Blue Cross $368.40/yr. ($)	Total Per Position ($)	Total Cost ($)
I. Administrative staff									
Principal	1	250		22,482	1,018.06	161.86	368.40	24,030.32	24,030.32
Asst. principal	1	223		19,425	1,018.06	139.82	368.40	20,957.28	20,951.28
II. Teachers									
Teachers	37.5	194	69.14	13,413.16	798.08	96.55	368.40	14,676.19	550,357.13
Teachers	3	199	69.14	13,758.86	818.65	99.07	368.40	15,044.98	45,134.94
Teachers	3	210	69.14	14,519.40	863.90	104.54	368.40	15,856.24	47,568.72
Guidance	1	199	85.11	16,936.89	994.97	121.90	368.40	18,422.16	18,422.16
Guidance	1	223	85.11	18,979.53	1,018.06	136.66	368.40	20,502.65	20,502.65
Librarian	1	199	73.41	14,608.59	869.21	105.12	368.40	15,951.32	15,951.32
Teacher aides	3	188	32.32	6,076.16	361.53	43.78	368.40	6,849.87	20,549.61
Coaching Supplement				5,813	345.87			6,158.87	6,158.87
III. Support staff									
Office secretary	1	236	34.86	8,226.96	489.50	59.26	368.40	9,144.12	9,144.12
Office secretary	1	212	34.86	7,390.32	439.72	53.21	368.40	8,251.65	8,251.65
Bookkeeper middle	1	236	34.33	8,101.88	482.06	58.32	368.40	9,010.66	9,010.66
Guidance secretary	1	236	31.80	7,504.80	446.54	54.00	368.40	8,373.74	8,373.74
Library secretary	1	212	34.50	7,314.00	435.18	52.63	368.40	8,170.21	8,170.21
Head custodian B	1	260		10,971.11	652.78	78.98	368.40	12,071.27	12,071.27
Custodians	4.5	260		7,693.66	457.77	55.37	368.40	8,575.20	38,588.40
Cafe. manager II 7hr./day	1	186	4.65/hr.	6,054.30	360.23	43.56	368.40	6,826.49	6,826.49
Cook/baker 5hr./day	1	186	3.70/hr.	3,441.00	204.74		184.20	3,829.94	3,829.94
Cook/baker 6hr./day	1	186	3.70/hr.	4,129.20	245.69		184.20	4,559.09	4,559.09
Cafe. worker 5hr./day	1	186	3.13/hr.	2,910.90	173.20		184.20	3,268.30	3,268.30
Cafe. worker 3hr./day	4	186	3.13/hr.	1,746.54	103.92			1,850.46	7,401.84

TABLE A.5

STANDARDIZED EMPLOYEE COSTS FOR GRAHAM PARK MIDDLE (YRS) SCHOOL, 1977-78

Employees	No.	Days Employed X	Per Diem Rate ($) =	Annual Salary ($)	F.I.C.A. ($)	Life Ins. $7.20/$1,000/yr. ($)	Blue Cross $368.40/yr. ($)	Total Per Position ($)	Total Cost ($)
I. Administrative staff									
Principal	1	250		22,982	1,018.06	165.46	368.40	24,533.42	24,533.92
Asst. principal	1	250		20,925	1,018.06	150.62	368.40	22,462.08	22,462.08
II. Teachers									
Teachers	20	194	69.14	13,413.16	798.08	96.55	368.40	14,676.19	293,523.80
Teachers	13	230	69.14	15,902.20	946.18	114.48	368.40	17,331.26	225,306.38
Teachers	9	240	69.14	16,593.60	984.59	119.45	368.40	18,066.04	162,594.36
Guidance	2	230	85.11	19,575.30	1,018.06	140.90	368.40	21,102.66	42,205.32
Librarian	1	230	73.41	16,884.30	993.38	121.54	368.40	18,367.62	18,367.62
Aides	4	230	32.32	7,433.60	442.30	53.50	368.40	8,297.80	33,191.20
Coaching supplement				5,408	321.78			5,729.78	5,729.78
III. Support staff									
Admin. secretary middle	1	236	41.14	9,709.04	577.69	69.84	368.40	10,724.97	10,724.97
Bookkeeper middle	1	236	34.33	8,101.88	482.06	58.32	368.40	9,010.66	9,010.66
Guidance secretary	1	236	31.80	7,504.80	446.54	54.00	368.40	8,373.74	8,373.74
Library secretary	1	236	34.50	8,142.00	484.45	58.61	368.40	9,053.46	9,053.46
Head custodian B	1	260		10,971.11	652.78	78.98	368.40	12,071.27	12,071.27
Custodians	4.5	260		7,693.66	457.77	55.37	368.40	8,575.20	38,588.40
Cafe. manager II 7hr./day	1	240	4.65/hr.	7,812.00	464.81	56.23	368.40	8,701.44	8,701.44
Cook/baker 6hr./day	1	240	3.70/hr.	5,328.00	317.02		184.20	5,829.22	5,829.22
Cook/baker 5.5hr./day	1	240	3.70/hr.	4,884.00	290.60		184.20	5,358.80	5,358.80
Cafe. worker 5.5hr./day	1	240	3.13/hr.	4,131.60	245.83		184.20	4,561.63	4,561.63
Cafe. worker 4hr./day	1	240	3.13/hr.	3,004.80	178.79		184.20	3,367.79	3,367.79

TABLE A.6

STANDARDIZED EMPLOYEE COSTS FOR STONEWALL JACKSON SENIOR HIGH (TRADITIONAL) SCHOOL, 1977-78

Employees	No.	Days Employed	x Per Diem Rate ($)	= Annual Salary ($)	F.I.C.A ($)	Life Ins. $7.20/$1,000/yr. ($)	Blue Cross $368.40/yr. ($)	Total Per Position ($)	Total Cost ($)
I. Administrative staff									
Principal	1	250		26,767	1,018.06	192.67	368.40	28,346.13	28,346.13
Asst. principal	3	223		20,315	1,018.06	146.23	368.40	21,847.69	65,543.07
II. Teachers									
Teachers	78	194	72.16	13,999.04	832.94	100.80	368.40	15,301.18	1,193,492.04
Teachers	3	199	72.16	14,539.84	854.41	103.39	368.40	15,686.04	47,058.12
Teachers	1	200	72.16	14,432.00	858.70	103.90	368.40	15,763.00	15,763.00
Teachers	6	210	72.16	15,153.60	901.64	109.80	368.40	16,533.44	99,200.64
Teachers	10	223	72.16	16,091.68	957.45	115.85	368.40	17,533.38	175,333.80
Guidance	4	199	86.01	17,115.99	1,000.39	123.19	368.40	18,607.97	74,431.88
Guidance	1	223	86.01	19,180.23	1,018.06	138.10	368.40	20,704.79	20,704.79
Librarians	3	199	71.80	14,288.20	850.15	102.89	368.40	15,609.64	46,828.92
Teacher aide	1	188	32.32	6,076.16	361.53	43.78	368.40	6,849.87	6,849.87
Coaching supplement				21,502	1,279.37			22,781.37	22,781.37
III. Support staff									
Office secretary	3	236	34.86	8,266.96	489.50	59.26	368.40	9,144.12	27,432.36
Admin. secretary	1	260		11,474.00	682.70	82.58	368.40	12,607.68	12,607.68
Bookkeeper	1	236	40.08	9,458.88	562.80	68.11	368.40	10,458.19	10,458.19
Guidance secretary	1.5	236	31.80	7,504.80	446.54	54.00	368.40	8,373.74	12,560.61
Library secretary	1	212	34.50	7,314.00	435.18	52.63	368.40	8,170.21	8,170.21
Head custodian A	1	260		10,305.50	613.18	74.16	368.40	11,361.24	11,361.24
Asst. head custodian	1	260		9,978.00	593.69	71.86	368.40	11,011.95	11,011.95
Custodians	15	260		7,693.66	457.77	55.37	368.40	8,575.20	128,628.00
Building engineer	1	260		10,589.33	630.07	76.25	368.40	11,664.05	11,664.05
Cafe. manager IV 7hr./day	1	260	186	7,382.34	439.25	53.14	368.40	8,243.13	8,243.13
Cafe. asst. manager I 6hr./day	1	5.67/hr.	186	4,352.40	258.97	31.32	368.40	5,011.09	5,011.09
Cook/baker 5.5hr./day	2	3.90/hr.	186	3,785.10	225.21		184.20	4,194.51	8,389.02
Cook/baker 5 hr./day	1	3.70/hr.	186	3,441.00	204.74		184.20	3,829.94	3,829.94
Cafe. worker 4.5hr./day	8	3.13/hr.	186	2,619.81	155.88		184.20	2,959.89	23,679.12
Cafe. worker 3.5hr./day	1	3.13/hr.	186	2,037.63	121.24			2,158.87	2,158.87
Cafe. worker 3.0hr./day	1	3.13/hr.	186	1,746.54	103.92			1,850.46	1,850.46
Cafe. worker 5.0hr./day	2	3.13/hr.	186	2,910.90	173.20		184.20	3,268.30	6,536.60
Cafe. worker 5.5hr./day	1	3.13/hr.	186	3,201.99	190.52		184.20	3,576.71	3,576.71

TABLE A.7

STANDARDIZED EMPLOYEE COSTS FOR WOODBRIDGE SENIOR HIGH (YRS) SCHOOL, 1977-78

Employees	No.	Days Employed x	Per Diem Rate ($) =	Annual Salary ($)	F.I.C.A ($)	Life Ins. $7.20/$1,000/yr. ($)	Blue Cross $368.40/yr. ($)	Total Per Position ($)	Total Cost ($)
I. **Administrative staff**									
Principal	1	250		27,767	1,018.06	199.94	368.40	29,533.40	29,353.40
Asst. principal	5	250		21,815	1,018.06	157.03	368.40	23,358.49	116,792.45
II. **Teachers**									
Teachers	81	194	72.16	13,999.04	832.94	100.80	368.40	15,301.18	1,239,395.58
Teachers	5	220	72.16	15,875.20	944.57	114.26	368.40	17,302.43	76,302.43
Teachers	48	230	72.16	16,596.80	984.68	119.52	368.40	18,069.40	867,331.20
Teachers	14	240	72.16	17,318.40	1,006.51	124.56	368.40	18,817.87	263,450.18
Guidance	6	230	86.01	19,782.30	1,018.06	142.42	368.40	21,311.18	127,867.08
Guidance	2	194	86.01	16,685.94	987.38	120.10	368.40	18,161.82	36,323.64
Librarians	3	230	71.80	16,514.00	982.18	118.87	368.40	17,983.45	53,950.35
Teacher aide	2	230	32.32	7,433.60	442.30	53.50	368.40	8,297.80	16,595.60
Coaching supplement				22,028	1,310.67			8,297.80	34,338.67
III. **Support staff**									
Office secretary	5	236	34.86	8,226.96	489.50	59.26	368.40	9,144.12	45,720.60
Admin. secretary	1	260	44.13	11,474.00	682.70	82.58	368.40	12,607.68	12,607.68
Bookkeeper	1	260		10,419.60	515.77	74.95	368.40	11,378.72	11,378.72
Library secretary	2	236	34.50	8,142.00	484.45	58.61	368.40	9,053.46	18,106.92
Guidance secretary	2	236	31.80	7,504.80	446.54	54.00	368.40	8,373.74	16,747.48
Head custodian A	1	260		10,305.50	613.18	74.16	368.40	11,361.24	11,361.24
Custodians	16	260		7,693.66	457.77	55.37	368.40	8,575.20	137,203.20
Building engineer	1	260		10,589.33	630.07	76.25	368.40	11,664.05	11,664.05
Cafe. manager IV 7hr./day	1	240	@5.67/hr.	9,525.60	566.77	68.62	368.40	10,529.39	10,529.39
Cafe. asst. manager I 6hr./day	1	240	@3.90/hr.	5,616.00	334.15	40.39	368.40	6,358.94	6,358.94
Cook/baker 6hr./day	2	240	@3.70/hr.	5,328.00	317.02		184.20	5,829.22	11,658.44
Cafe. work 6hr./day	6	240	@3.13/hr.	4,507.20	268.18		184.20	4,959.58	29,757.48
Cafe. work 4hr./day	1	240	@3.13/hr.	3,004.80	178.79		184.20	3,367.79	3,367.79
Cafe. work 3hr./day	6	240	@3.13/hr.	2,253.60	134.09			2,387.69	14,326.14

TABLE A.8

STANDARDIZED EMPLOYEE COSTS, ACTUAL AND STIMULATED, FOR MINNIEVILLE ELEMENTARY (YRS) SCHOOL

		YRS Based on Actual ADM (ADM 761.02)			Traditional Simulated at Actual ADM x .75 (ADM 570.77)			YRS Simulated at Capacity ADM x 1.33 (ADM 946.64)			Traditional Simulated at Capacity ADM (ADM 710)		
			Cost			Cost			Cost			Cost	
Type of Employee	Actual Annual Salary and Fringe Cost Per Employee ($)	Employees Required	Total ($)	Per ADM ($)	Employees Required	Total ($)	Per ADM ($)	Employees Required	Total ($)	Per ADM ($)	Employees Required	Total ($)	Per ADM ($)
I. Principal	25,221.81	1	25,221.81	33.14	1	24,718.21	43.31	1	25,221.81	26.64	1	24,718.21	34.81
Asst. principal	21,189.01	1	21,189.01	27.84	1	18,135.98	31.77	1	21,189.01	22.38	1	18,135.98	25.54
II. Teacher by contract length													
194	14,785.78	25	369,644.50	485.72	18.95	280,190.53	490.90	31.1	459,837.76	485,76	23.58	348,648.69	491.05
194 kinder.	13,221.08				1.58	20,899.31	36.36				1.96	25,913.32	36.50
230 kinder.	15,606.44	2	31,902.88	41.92				2.49	38,860.04	41.05			
Teacher aide 230	8,297.80	3	24,893.40	32.71					30,950.79	32.70			
Teacher aide 188	6,849.87				1.6	10,959.79	19.20	3.73			1.98	13,562.74	19.10
Librarian	18,360.51	1	18,360.51	24.13	1	15,945.00	27.94	1	18,360.51	19.40	1	15,945.00	22.46
III. Support staff													
Office sec. 212	8,251.65	2.23	18,401.18	24.18	1.68	13,862.77	24.29	2.78	22,939.59	24.23	2.09	17,245.95	24.29
Library sec.	9,053.46	1	9,053.46	11.90	1	8,170.21	14.31	1	9,053.46	9.56	1	8,170.21	11.51
Head cust. B	12,071.27	1	12,071.27	15.86	1	12,071.27	21.15	1	12,071.27	12.75	1	12,071.27	17.00
Custodians	8,575.20	2	17,150.40	22.54	2	17,150.40	30.05	2	17,150.40	18.12	2	17,150.40	24.16
Cafe. manager II	8,701.44	1	8,701.44	11.43	1	6,826.49	11.96	1	8,701.44	9.19	1	6,826.49	9.61
Cafe. work cook/ baker 186	2,625.38				4.76	12,496.81	21.89				5.92	15,542.25	21.89
Cafe. work cook/ baker 240	3,341.69	4.14	13,834.60	18.18				5.14	17,176.29	18.14			
Cafeteria aide	1,545.81	1	1,545.81	2.03	1	1,198.29	2.10	1	1,545.81	1.63	1	1,198.29	1.69

Note: Where relevant, the Minnieville actual pupil teacher ratio of 27.80 was used.

STANDARDIZED EMPLOYEE COSTS, ACTUAL AND SIMULATED, FOR MARSTELLER MIDDLE (TRADITIONAL) SCHOOL

		Traditional Based on Actual ADM (ADM 837.34)			YRS Simulated at Actual ADM x 1.33 (ADM 1,116.43)			Traditional Simulated at Capacity ADM (ADM 945)			YRS Simulated at Capacity ADM x 1.33 (ADM 1,259.97)		
			Cost			Cost			Cost			Cost	
Type of Employee	Actual Annual Salary and Fringe Costs Per Employee ($)	Employees Required	Total ($)	Per ADM ($)	Employees Required	Total ($)	Per ADM ($)	Employees Required	Total ($)	Per ADM ($)	Employees Required	Total ($)	Per ADM ($)
I. Principal	24,030.32	1	24,030.32	28.70	1	24,533.92	21.98	1	24,030.32	25.43	1	24,533.92	19.47
Asst. principal	20,951.28	1	20,951.28	25.02	2	44,924.16	40.24	1	20,951.28	22.17	2	44,924.16	35.65
II. Teachers by contract length													
194	14,676.19	37.5	550,357.13	657.27	25.10	368,372.37	329.96	42.31	620,949.60	657.09	28.33	415,776.46	329.99
199	15,044.98	3	45,134.94	53.90				3.38	50,852.03	53.81			
210	15,856.24	3	47,568.72	56.81				3.38	52,484.15	55.54			
230	17,331.26				16.32	282,846.16	253.35				18.41	319,068.50	253.23
240	18,066.04				11.30	204,146.25	182.86				12.75	230,342.01	182.82
Guidance 199	18,422.16	1	18,422.16	22.00				1.13	20,817.04	22.03			
Guidance 223	20,502.65	1	20,502.65	24.49				1.13	23,167.99	24.52			
Guidance 230	21,102.66				2.61	55,077.94	49.33				2.94	62,041.82	49.24
Librarian	15,951.32	1	15,951.32	19.05	1	18,367.62	16.45	1	15,951.32	16.88	1	18,367.62	14.58
Teacher aides 188	6,849.87	3	20,549.61	24.54				3.39	23,221.06	24.57			
Teacher aides 230	8,297.80				5.21	43,231.54	38.72				5.88	48,791.06	38.72
Coaching supplement	6,158.87		6,158.87	7.36		6,158.87	5.52		6,158.87	6.52		6,158.87	4.89
III. Support staff													
Office sec. 212	8,251.65	1.43	11,799.86	14.09	1.91	15,760.65	14.12	1.68	13,367.67	14.15	2.15	17,741.05	14.08
Bookkeeper	9,010.66	1	9,010.66	10.76	1	9,010.66	8.07	1	9,010.66	9.54	1	9,010.66	7.15
Guidance sec.	8,373.74	1	8,373.74	10.00	1	8,373.74	7.50	1	8.373.74	8.86	1	8,373.74	6.65
Lib. sec. (212&236)	8,170.21	1	8,170.21	9.76	1	9,053.46	8.11	1	8,170.21	8.65	1	9,053.46	7.19
Head cust. B	12,071.27	1	12,071.27	14.42	1	12,071.27	10.81	1	12,071.27	12.77	1	12,071.27	9.58
Custodians	8,575.20	4.5	38,588.40	46.08	4.5	38,588.40	34.56	4.5	38,588.40	40.83	4.5	38,588.40	30.63
Cafe. manager II	6,826.49	1	6,826.49	8.15	1	8,701.44	7.79	1	6,826.49	7.22	1	8,701.44	6.91
Cafe. work cook/ baker 186	2,838.21	6.98	19,810.71	23.66				7.88	22,365.09	23.67			
Cafe. work cook/ baker 240	3,616.31				6.07	21,951.00	19.66				6.85	24,771.72	19.66

Note: Where relevant, the Marsteller actual pupil teacher ratio of 19.11 was used.

TABLE A.10

STANDARDIZED EMPLOYEE COSTS, ACTUAL AND SIMULATED, FOR GRAHAM PARK MIDDLE (YRS) SCHOOL

		YRS Based on Actual ADM (ADM 856.43)			Traditional Simulated at Actual ADM x .75 (ADM 642.32)			YRS Simulated at Capacity ADM x 1.33 (ADM 1,186.64)			Traditional Simulated at Capacity ADM (ADM 890)		
			Cost			Cost			Cost			Cost	
Type of Employee	Actual Annual Salary and Fringe Costs Per Employee ($)	Employees Required	Total ($)	Per ADM ($)	Employees Required	Total ($)	Per ADM ($)	Employees Required	Total ($)	Per ADM ($)	Employees Required	Total ($)	Per ADM ($)
I. Principal	24,533.92	1	24,533.92	28.65	1	24,030.32	37.41	1	24,533.92	20.68	1	24,030.32	27.00
Asst. principal	22,462.08	1	22,462.08	26.23	1	20,951.28	32.62	2	44,924.16	37.86	1	20,951.28	23.54
II. Teachers by contract length													
194	14,676.19	20.0	293,523.80	342.73	29.87	438,377.80	682.49	27.71	406,677.22	342.71	41.39	607,447.50	682.53
199	15,044.98				2.39	35,957.50	55.98				3.31	49,798.88	55.95
210	15,856.24				2.39	37,896.41	59.00				3.31	52,484.15	58.97
230	17,331.26	13	225,306.38	263.08				18.01	312,135.99	263.04			
240	18,066.04	9	162,594.36	189.85				12.47	225,283.52	189.85			
Guidance 199	18,422.16				.77	14,185.06	22.08				1.08	19,527.49	21.94
Guidance 223	20,502.65				.77	15,787.04	24.58				1.06	21,732.81	24.42
Guidance 230	21,102.66	2	42,205.32	49.28				2.77	58,454.37	49.26			
Librarian	18,367.62	1	18,367.62	21.45	1	15,951.32	24.83	1	18,367.62	15.48	1	15,951.32	17.92
Teacher aide 188	6,849.87				2.30	15,754.70	24.53				3.19	21,851.09	24.55
Teacher aide 230	8,297.80	4	33,191.20	38.76				5.54	45,969.81	38.74			
Coaching supplement	5,729.78		5,729.78	6.69		5,729.78	8.92		5,729.78	4.83		5,729.78	6.44
III. Support staff													
Office sec. 212	8,251.65	1.46	12,047.41	14.07	1.1	9,076.82	14.13	2.03	16,750.85	14.12	1.52	12,542.51	14.09
Bookkeeper	9,010.66	1	9,010.66	10.52	1	9,010.66	14.03	1	9,010.66	7.59	1	9,010.66	10.12
Guidance sec.	8,373.74	1	8,373.74	9.78	1	8,373.74	13.04	1	8,373.74	7.06	1	8,373.74	9.41
Lib. sec. (236 & 212)	9,053.46	1	9,053.46	10.57	1	8,170.21	12.72	1	9,053.46	7.63	1	8,170.21	9.18
Head cust. B	12,071.27	1	12,071.27	14.09	1	12,071.27	18.79	1	12,071.27	10.17	1	12,071.27	13.56
Custodians	8,575.20	4.5	38,588.40	45.06	4.5	38,588.40	60.08	4.5	38,588.40	32.52	4.5	38,588.40	43.36
Cafe. manager II	8,701.44	1	8,701.44	10.16	1	6,826.49	10.63	1	8,701.44	7.33	1	6,826.49	7.67
Cafe. work cook/ baker 186	2,838.21				5.35	15,184.42	23.64				7.42	21,059.52	23.66
Cafe. work cook/ baker 240	3,616.31	4.65	16,815.84	19.63				6.45	23,325.20	19.66			

Note: Where relevant, the Graham Park actual pupil teacher ratio of 18.40 was used.

TABLE A.11

STANDARDIZED EMPLOYEE COSTS, ACTUAL AND SIMULATED, FOR STONEWALL JACKSON SENIOR HIGH (TRADITIONAL) SCHOOL

Type of Employee	Actual Annual Salary and Fringe Costs Per Employee ($)	Traditional Based on Actual ADM (ADM 2,076.81)			YRS Simulated at Actual ADM x 1.33 (ADM 2,769.01)			Traditional Simulated at Capacity ADM (ADM 2,290)			YRS Simulated at Capacity ADM x 1.33 (ADM 3,053.26		
			Cost			Cost			Cost			Cost	
		Employees Required	Total ($)	Per ADM ($)	Employees Required	Total ($)	Per ADM ($)	Employees Required	Total ($)	Per ADM ($)	Employees Required	Total ($)	Per ADM ($)
I. Principal	28,346.13	1	28,346.13	13.65	1	29,353.40	10.60	1	28,346.13	12.38	1	29,353.40	9.61
Asst. principal	21,847.69	3	65,543.07	31.56	5	116,792.45	42.18	4	87,390.76	38.16	5	116,792.45	38.25
II. Teachers by contract length													
194	15,301.18	78	1,193,492.04	574.68	67.18	1,027,933.27	371.23	85.99	1,315,748.47	574.56	74.07	1,133,358.40	371.20
199	15,686.04	3	47,058.12	22.66				3.30	51,763.93	22.60			
200	15,763.00	1	15,763.00	7.59				1.10	17,339.30	7.57			
210	16,533.44	6	99,200.64	47.77				6.62	109,451.37	47.80			
220	17,302.43				4.14	71,632.06	25.87				4.57	79,072.11	25.90
223	17,533.38	10	175,333.80	84.42				11.02	193,217.85	84.37			
230	18,069.40				39.81	719,342.81	259.78				43.90	793,246.66	259.80
240	18,817.87				11.61	218,475.47	78.90				12.80	240,868.74	78.89
Guidance 194	18,161.82				1.65	29,967.00	10.82				1.82	33,054.51	10.83
Guidance 199	18,607.93	4	74,431.88	35.84				4.41	82,061.15	35.83			
Guidance 223	20,704.79	1	20,704.79	9.97				1.10	22,775.27	9.95			
Guidance 230	21,311.18				4.95	105,490.34	38.10				5.47	116,572.15	38.18
Librarians	15,609.64	3	46,828.92	22.55	3	53,950.35	19.48	3	46,828.92	20.45	3	53,950.35	17.67
Coaching supplement	22,781.37		22,781.37	10.97		22,781.37	8.23		22,781.37	9.95		22,781.37	7.46
Teacher aide 230	8,297.80				1.65	13,691.37	4.94				1.82	15,102.00	4.95
Teacher aide 188	6,849.87	1	6,849.87	3.30				1.10	7,534.86	3.29			
III. Support staff													
Office sec. 236	9,144.12	3.05	27,889.57	13.43	4.06	37,125.13	13.41	3.36	30,724.24	13.42	4.48	40,965.66	13.42
Admin. sec. 260	12,607.68	1	12,607.68	6.07	1	12,607.68	4.55	1	12,607.68	5.51	1	12,607.68	4.13
Bookkeeper (260&236)	10,458.19	1	10,458.19	5.04	1	11,378.72	4.11	1	10,458.19	4.57	1	11,378.72	3.73
Lib. sec. (236&212)	8,170.21	1	8,170.21	3.93	1.65	14,938.21	5.39	1.10	8,987.23	3.92	1.82	16,477.30	5.40
Guidance sec. 236	8,373.74	1.36	11,388.29	5.48	1.81	15,156.47	5.47	1.50	12,560.61	5.48	2.00	16,747.48	5.49
Head cust. A	11,361.24	1	11,361.24	5.47	1	11,361.24	4.10	1	11,361.24	4.96	1	11,361.24	3.72
Asst. head cust.	11,011.95	1	11,011.95	5.30	1	11,011.95	3.98	1	11,011.95	4.81	1	11,011.95	3.61
Custodians	8,575.20	15	128,628.00	61.94	15	128,628.00	46.45	15	128,628.00	56.17	15	128,628.00	42.13
Building engineer	11,664.05	1	11,664.05	5.62	1	11,664.05	4.21	1	11,664.05	5.09	1	11,664.05	5.40
Cafe. manager	8,243.13	1	8,243.13	3.97	1	10,529.39	3.80	1	8,243.13	3.60	1	10,529.39	3.45
Cafe. asst. manager	5,011.09	1	5,011.09	2.41	1	6,358.94	2.30	1	5,011.09	2.19	1	6,358.94	2.08
Cafe. work cook/ baker 186	2,712.09	17.31	46,946.28	22.60				19.08	51,746.68	22.60			
Cafe. work cook/ baker 240	3,453.57				15.05	51,976.23	18.77				16.59	57,294.73	18.77

---

the Stonewall Jackson actual pupil teacher ratio of 20.75 was used.

TABLE A.12

STANDARDIZED EMPLOYEE COSTS, ACTUAL AND SIMULATED, FOR WOODBRIDGE SENIOR HIGH (YRS) SCHOOL

		YRS Based on Actual ADM (ADM 3,351.85)			Traditional Simulated at Actual ADM x .75 (ADM 2,513.89)			YRS Simulated at Capacity ADM x 1.33 (ADM 3,173.25)			Traditional Simulated at Capacity ADM (ADM 2,380)		
			Cost			Cost			Cost			Cost	
Type of Employee	Actual Annual Salary and Fringe Costs Per Employee ($)	Employees Required	Total ($)	Per ADM ($)	Employees Required	Total ($)	Per ADM ($)	Employees Required	Total ($)	Per ADM ($)	Employees Required	Total ($)	Per ADM ($)
I. Principal	29,353.40	1	29,353.40	8.76	1	28,346.13	11.28	1	29,353.40	9.25	1	28,346.13	11.91
Asst. principal	23,358.49	5	116,792.45	34.84	4	87,390.76	34.76	5	116,792.45	36.81	4	87,390.76	36.72
II. Teachers by contract length													
194	15,301.18		1,239,395.58	369.76	94.04	1,438,922.97	572.39	76.69	1,173,447.49	369.79	89.03	1,362,264.06	572.38
199	15,686.04				3.61	56,626.60	22.53				3.42	53,646.26	22.54
200	15,763.00				1.21	19,073.23	7.59				1.14	17,969.82	7.55
210	16,533.44				7.24	119,702.11	47.62				6.85	113,254.06	47.59
220	17,302.43	5	76,302.43	22.76				4.73	81,840.49	25.79			
223	17,533.38				12.05	211,277.23	84.04				11.41	200,055.87	84.06
230	18,069.40	48	867,331.20	258.76				45.45	821,254.23	258.81			
240	18,817.87	14	263,450.18	78.60				13.25	249,336.78	78.57			
Guidance 194	18,161.82	2	36,323.64	10.84				1.89	34,325.84	10.82			
Guidance 199	18,607.97				4.84	90,062.57	35.83				4.58	85,224.50	35.81
Guidance 223	20,704.79				1.21	25,052.80	9.97				1.15	23,810.51	10.00
Guidance 230	21,311.18	6	127,867.08	38.15				5.68	121,047.50	38.15			
Librarians	17,983.45	3	53,950.35	16.10	3	46,828.92	18.63	3	53,950.35	17.00	3	46,828.92	19.68
Coaching supplement	23,338.67		23,338.67	6.96		23,338.67	9.28		23,338.67	7.35		23,338.67	9.81
Teacher aide 230	8,297.80	2	16,595.60	4.95				1.89	15,682.84	4.94			
Teacher aide 188	6,849.87				1.21	8,288.34	3.30				1.15	7,877.35	3.31
III. Support staff													
Office sec. 236	9,144.12	4.92	44,989.07	13.42	3.69	33,741.80	13.42	4.66	42,611.60	13.43	3.49	31,912.98	13.41
Admin. sec. 260	12,607.68	1	12,607.68	3.76	1	12,607.68	5.02	1	12,607.78	3.97	1	12,607.68	5.30
Bookkeeper (260&236)	11,378.72	1	11,378.72	3.39	1	10,458.19	4.16	1	11,378.72	3.59	1	10,458.19	4.39
Lib. sec. (236&212)	9,053.46	2	18,106.92	5.40	1.21	9,885.95	3.93	1.89	17,111.04	5.39	1.15	9,395.74	3.95
Guidance sec. 236	8,373.74	2.19	18,338.49	5.47	1.64	13,732.93	5.46	2.07	17,333.64	5.46	1.56	13,063.03	5.49
Head cust. A	11,361.24	1	11,361.24	3.39	1	11,361.24	4.52	1	11,361.24	3.58	1	11,361.24	4.77
Custodians	8,575.20	16	137,203.20	40.93	16	137,203.20	54.58	16	137,203.20	43.24	16	137,203.20	57.65
Building engineer	11,664.05	1	11,664.05	3.48	1	11,664.05	4.64	1	11,664.05	3.68	1	11,664.05	4.90
Cafe. manager	10,529.39	1	10,529.39	3.14	1	8,243.13	3.28	1	10,529.39	3.32	1	8,243.13	3.46
Cafe. asst. manager	6,358.94	1	6,358.94	1.90	1	5,011.09	1.99	1	6,358.94	2.00	1	5,011.09	2.11
Cafe. work cook/ baker 186	2,712.09				20.95	56,818.29	22.60				19.83	53,780.74	22.60
Cafe. work cook/ baker 240	3,453.57	18.22	62,924.05	18.77				17.25	59,574.08	18.77			

Note: Where relevant, the Woodbridge actual pupil teacher ratio of 20.[illegible]3 was used.

GLOSSARY

ADA. Average daily attendance. ADA is derived by summing daily attendance for the school year and dividing by the number of school days.

ADM. Average daily membership. ADM is derived by summing daily membership for the school year and dividing by the number of school days.

Annualized cost. The annual cost of a capital item such as building or equipment. Annualized cost is composed of the principal and interest payment necessary to pay for the capital item based on a bond maturity equivalent to the life span of the item.

Capacity. The ADM a building is designed to accommodate under traditional operation. The capacity figure is determined by the staff of Prince William County Schools and approved by the School Board. It is primarily a function of floor space and each room's program assignment.

Capacity x 1.33. The ADM a building is designed to accommodate under YRS operation. This figure is determined by multiplying capacity by 1.33.

Capacity utilization ratio. Actual ADM divided by (traditional) capacity ADM.

Color group. In Prince William County, YRS student bodies are divided into four color groups for easy identification. On any given school day, three of the color groups are in session and one is on vacation.

Division-wide overhead costs. Costs that are spread over all students at one of the three grade levels (elementary, middle, or senior), such as elementary special education.

Extended contract. A contract greater than 194 days, the typical contract length for traditional calendar teachers.

F.I.C.A. tax. Federal Insurance Contributions Act tax, popularly known as the Social Security tax.

In-service days. Teacher work days outside of the classroom used for staff meetings and additional short-term training.

Mean per diem rate. Average salary per day for a particular position derived by dividing total salaries for that position by the number of employee contract days.

Pupil teacher ratio. ADM x 194 (the number of school days) divided by the total number of teacher contract days. At the elementary level, Title I, art, music, and physical education teachers were excluded because individual teachers may serve more than one school. At the middle and senior high levels, Title I and special education teachers were excluded because the teachers are assigned on the basis of school population characteristics.

Singleton courses. Special advanced courses (e.g., French-5, aerospace, advanced calculus) that have a limited number of students per class.

SRI. Stanford Research Institute.

Staffing pattern. A term used to describe the management of a school as it relates to such policies as the percentage of total teacher days covered by extended contracts and the assignment in number and by contract length of assistant principals, librarians, guidance counselors, and classified workers.

System-wide overhead costs. Costs that are spread across all students, such as general administration.

TMI. Tayloe Murphy Institute.

Traditional calendar school. A school open for regular students nine or ten months of the year. In Prince William County the traditional calendar has 186 days of instruction including six days available as snow days.

Turnkey. Education Turnkey Systems, Inc.

YRS. Year-round school. A school operating a regular program throughout the year. As used in this study and Prince William County, YRS refers to the 45-15 method of operation under which on any given school day three-fourths of the students attend and one-fourth are on vacation. In Prince William County, YRS schools have 180 days of instruction with no snow days.